

Use of Tenses in Individual Parts of Research Papers in Technology

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Leech, Geoffrey Neil. 2004. Meaning and the English verb. London: Pearson Education Limited.

Quirk Randolph et al. 1985. A comprehensive grammar of the English language. Harlow: Longman.

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ABSTRAKT

Tato bakalářská práce se zabývá výskytem slovesných časů v odborných člancích z oblasti techniky. Práce je rozdělena do dvou částí.

Cílem teoretické části je seznámit čtenáře se systémem slovesných časů v obecné a akademické angličtině. Dále se teoretická část zabývá odborným článkem jakožto žánrem a podává čtenáři informace o obsahu jeho jednotlivých částí.

Cílem praktické části je analyzovat slovesné časy v jednotlivých částech vybraných odborných článků z oblasti techniky v rozmezí dvaceti let a porovnat, zda se teorie shoduje s praxí, a také zjistit, jestli se jejich výskyt postupem času mění.

Klíčová slova: slovesný čas, odborný článek, obecná angličtina, akademická angličtina, minulý čas, přítomný čas, budoucí čas

ABSTRACT

This bachelor thesis focuses on the distribution of verb tenses in research papers in the field of technology. The thesis is divided into two parts.

The aim of the theoretical part is to acquaint the readers with the system of tenses in general and academic English. Further the theoretical part deals with the genre of research paper and informs the readers about the content of its individual parts.

The aim of the practical part is to analyze the tenses in the individual parts of the chosen technology research papers in the range of twenty years and compare, if the theory agrees with the practice, and also find out whether their occurrence is changing with time or not.

Keywords: verb tense, research paper, general English, academic English, past tense, present tense, future tense

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INTRODUCTION

At present, the English language is considered a lingua franca and its knowledge is expected for effective communication in an international environment. Beside general communication purposes, the use of language in technical areas, such as the research area, is equally important, perhaps even more important.

Standard tools for communicating the results in this area are research papers. Their language slightly differentiates from general English; furthermore, the way how non native speakers write in English can cause the change of the language in the course of time. Therefore, in this bachelor thesis we will deal with the aspect of tense, and we will also study if the use of tenses has changed in the range of the analyzed twenty years. Because over the time of writing this genre the structure of the research paper has stabilized, we will focus on how the tenses occur in its individual parts.

The thesis is divided into two parts: theoretical and practical. The first chapter of the theoretical part focuses on the usage of tenses in general and academic English. The tenses that most frequently occur in the research paper are first described from the view of general English and then from the view of academic English. The theory is accompanied by figures and examples for better understanding. The second chapter of the theoretical part deals with the genre of research paper which is first explained and then a brief history of its development and usage in the field of science and technology are mentioned. The rest of this chapter focuses on the individual parts of the main body of the research paper that are Introduction, Methods, Results and Discussion, and Conclusion. Each section is described in terms of its content and the usage of tenses. The theoretical part is finished with information about the database from which the research papers were downloaded.

The practical part focuses on the analysis of the chosen research papers. At the beginning the information about the corpus of the journal that was chosen for the analysis is provided then the process of the analysis of the research articles is briefly described. The rest of the practical part focuses on the results obtained from the analysis. These results are explained on the basis of bar charts and examples of tenses that occurred in the corresponding sections of research papers are given.

The aim of this thesis is to find out if the use of tenses in individual parts of selected research papers from the area of polymer technology, one of the leading branches at Tomas Bata University in Zlín, is coincident with the information stated in the published literature,

and also whether the usage of tenses in individual parts of research papers changes in the course of time.

I. THEORY

1 USE OF TENSES IN GENERAL AND ACADEMIC ENGLISH

“Tense is a grammatical category referring to the location of a situation in time.” (Greenbaum 1996, 253) It occurs almost in every language on the world. Due to the verb tense it is possible to recognize if an activity happened in the past, if it is happening now or if it will happen in the future.

The English language has a quite complex system of verb tenses in contrast to the Czech language. In Czech grammar there are only three tense categories: the present, the past and the future. English grammar has a similar division of tenses into the same three categories, but these categories are further divided into subcategories according to the aspect of the verb. According to Greenbaum (1996, 253-254), the aspect of the verb refers not so much to the precise location of the action in time, but rather to the way of how the time of the action is viewed. In the English language, there are two aspects: the perfective aspect and the progressive aspect. The perfective aspect is used when the situation is viewed as finished, while the progressive aspect is used when the situation is still in progress (Quirk et al. 1985, 189).

Figure 1 shows the graphical interpretation of tenses. In the middle of the timeline there is the present moment and as Quirk et al. (1985, 175) claim, “Anything ahead of the present moment is in the future, and anything behind it is in the past.”

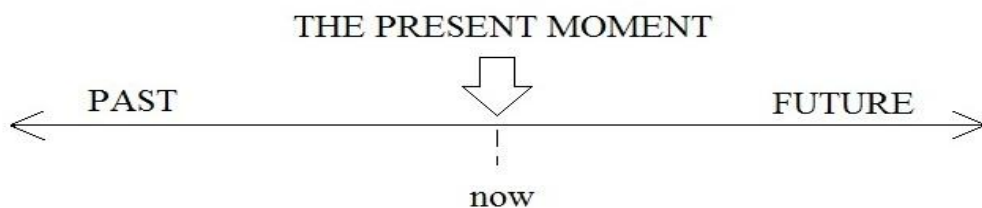


Figure 1: Timeline demonstrating tenses, *Source*: Quirk et al. 1985, 175.

In academic English, there are slightly different rules for the use of tenses than in general English. As stated by Tseng (2011) the usage of the verb tense is a quite complicated matter and therefore the verb tense choice of authors can differ according to the context, the overall purpose of the text and even according to what is being expressed. Waard (2012) claims that the use of the verb tense can differ among texts, depending on whether the text pertains to experimental results or to more abstract concepts.

As Taylor (1989, 150) notes, in academic writing the use of tenses, particularly the present and past tenses, follows certain rules that are not intuitively obvious. The genre of the academic research paper can appear in the field of linguistics, literature, science and technology, and virtually in any area dealing with serious research. For each of these fields, the rules can slightly differ, they are customary. However, in general the rules are as described in the following sections.

1.1 Present tenses

Into the group of present tenses that most frequently occur in the research paper belong present simple and present perfect (Swales and Feak, 1994). Based on the analysis, the present continuous also occurs in research papers, but not as frequently as the two previous tenses. Figure 2 presents the timeline of the present tense.

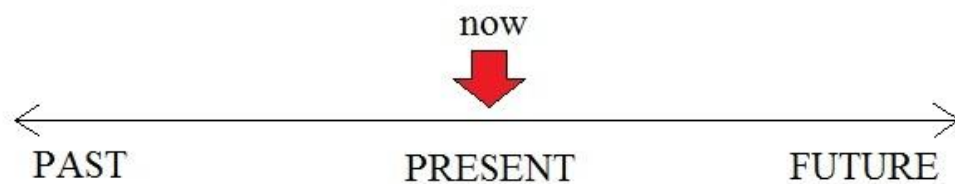


Figure 2: Present tense timeline

1.1.1 Present simple

One of the basic tenses in English is the present simple tense. The basic form of the present simple is: *Subject + Verb in present form* (i.e. the infinitive, in the 3rd person infinitive + (e)s).

From the viewpoint of general English, the present simple has a wide range of use. According to Svoboda and Kučera (2003, 17) the present tense can be used to express habitual or repeated situations, statements that are universal, and actions that are in progress at the present moment, specifically with verbs that are not usually used in the progressive form like *to see*, *to hear* etc. (verbs of perception). The present tense can be also used to express future. Most frequently it expresses future when talking about fixed arrangements, like meetings or schedules, about which someone is sure that they will happen. Moreover,

as Svoboda and Kučera (2003) claim, past actions can also be expressed by the present simple to make the narrative more vivid. In other words, to help the reader better imagine the situation.

Regarding to the use of the present simple tense from the viewpoint of academic English, Bem (2003) notes that the present tense is used to express results that are available for the reader at present, as in example [1], and to express general conclusions. APA (2001) also states that the present tense is used for the discussion of the results and presentation of the conclusions. When the researcher reports his conclusions in the present tense, the readers are allowed to join him in discussing the issue at hand (see example [2]). According to Salager-Meyer (1992), the present tense is used to express some established knowledge or the truth that is universal, and for enhancing the general validity of the specific results. Day (1995, 72) adds that the presentation of figures, tables, etc. is expressed in the present tense, as in example [3].

[1] *As Figure 3 shows, the macroscopic fracture surface is clearly indicative of...*

[2] *The results also demonstrate the possibility of making ...*

[3] *Figure 7 shows that...*

1.1.2 Present perfect

The present perfect tense is comprised of the verb have in the form of the present tense, and the perfect participle. Thus its form is *Subject + has/have + Verb in past participle form*. When the present perfect tense is used, the action that happened in the past is viewed from the present time perspective (Greenbaum 1996, 270).

As Svoboda and Kučera (2003) claim, the present perfect is used to express an action that took place in the past, but has consequences in the present. Another use of this tense is when some situation which started at some time in the past has been still in progress, up to the present moment. The present perfect is also used for talking about situations that happened in the past, but it is not important when exactly.

Concerning the usage or the present perfect tense in academic texts, the rules are following: Bem (2003) states, that the present perfect tense can be used to report the previous research of other researchers, as in example [1]. As APA (2001) notes, the present perfect tense is used to express a situation that occurred at an indefinite time in the past, or

for describing a situation that began in the past and continues to the present, as in [2]. According to Salager-Meyer (1992) the present perfect tense is used to show that the researcher disagrees with the previous research, as in example [3], and also when referring to the previous research in the area.

[1] ... *addition of TLCPs has been reported by several research groups.*

[2] *Since that time, several researchers have used this method.*

[3] *Although some authors have reported the appearance of..., it has been proven in our study that...*

1.1.3 Present continuous

The main purpose of the present continuous is to express an action that is happening at the moment of speaking, but it can be also used in other cases. The form of the present continuous is: *Subject + is/are + Verb in continuous form.*

As mentioned above, the present continuous tense is used to express actions that are in progress at the present moment, situations that are temporary or happening in the near future, or to talk about repeated actions (Svoboda and Kučera 2003, 18). In this case, the actions can be expressed in a positive sense, but also in a negative sense to express that someone is complaining, as shown in example [1]. However, this is not used in academic writing.

Looking at the present continuous tense from the perspective of academic English, it has similar use as in general English. It can be used to express an action of the research that is in progress at the present moment, as in example [2]. Further the present continuous can be used in research papers when describing the figures or tables [3] and for the description of the reaction course, as in example [4].

[1] *She is always leaving her clothes on the floor.*

[2] *We are currently examining this aspect.*

[3] *Each of the curves is approaching a different maximum value.*

[4] *The crystalline structure of ... is kinetically transitioning from phase II to IV.*

1.2 Past tenses

Into the group of past tenses that most frequently occur in the research paper belongs just the past simple tense. However, the past perfect can sometimes occur in research papers. Figure 3 depicts the interpretation of the past tense.

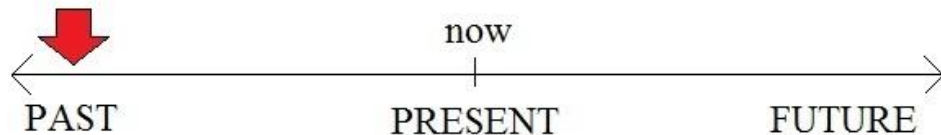


Figure 3: Past tense timeline

1.2.1 Past simple

The main use of the past simple tense is to express an action that was finished before the time of speaking or writing. The situation or action must be finished before the present moment; otherwise it would be the present perfect tense. The form of the past simple tense is *Subject + Verb in past form*.

The past simple tense has a wide range of use. The main use has already been mentioned; another use is for talking about some specific time in the past and for expressing several consecutive past actions. The past simple is also used to express actions that repeated in the past or to express habits in the past.

Concerning the use past tense in academic English, Bem (2003) claims, that the past tense is used when the researcher reports how the study was conducted, as in example [1]. This tense is also used when the researcher writes about the previous research of others, see example [2], which can also be taken as reference to a single literature source. APA (2001) notes, that the past tense is used for describing the results of the research, as shown in [3]. According to (Burrough-Boenisch 2003) “the finding is first reported in the past tense in a research article, because at the time of writing the results are still research-specific: they have not yet been accepted by the discourse community and become part of shared scientific knowledge”. The past simple is also used when reporting to a single research activity, as in [4].

- [1] ... we examined the level of liquid transfer from...
- [2] Chen and Kyu reported that the synthesis of...
- [3] Ion contents of all PPTA anions ranged between...
- [4] Previous studies of the crystallization kinetics and ... focused on fibre spinning of the polymer.

1.2.2 Past perfect

The past perfect tense refers to an action in the past that happened before another action in the past. This tense is comprised of the verb *have* in the past tense, and the perfect participle. Its form is *Subject + had + Verb in past participle form*.

Past perfect is also used in the third conditional, in the so called hypothetical past. It means that it is talking about things that did not happen.

In terms of the use of the past perfect simple in the academic English, the usage is similar to general English. In research papers, the past perfect tense is used when reporting that an action in the past took place before another action in the past, as in example [1] and [2].

- [1] *Measurements were made on samples that had been sealed between...*
- [2] ... the number of nucleated domains in ... was consistently greater than in ... that had been cooled to the same temperature.

1.3 Future tenses

According to Quirk et al. (1985), English has no future tense. Huddleston and Pullum (2002, 209) agree with Quirk et al. and add that while there are many ways how to indicate the future time, the category in grammar that can be analyzed as a future tense does not exist. Greenbaum (1996, 259) claims that the future time is most commonly expressed by the auxiliary verb *will* and the semi-auxiliary *be going to*.

Among the group of future tenses that occur in the research paper are the future simple tense and the construction *be going to*. Figure 4 shows a location of the future tense in time.

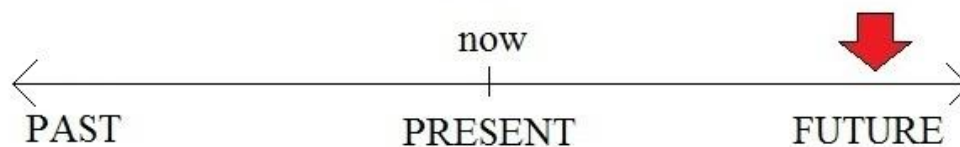


Figure 4: Future tense timeline

1.3.1 Future simple

The form of the future simple tense is following: *Subject + the modal verb will + infinitive*.

The future form *will* is used in many contexts in which it is appropriate to predict something. This use of future simple is mainly based on experience. This tense is used when talking about decisions that are unplanned, which means that they are made at the time of speaking. Another use of future simple is for making promises. Leech (2004, 57) adds that *will* and also other ways of how to refer to the future can be used when referring to a narrative future.

In academic English the future simple tense has similar rules for usage as in general English. The future simple in research paper is used to express what will happen during the research process, as in example [1]. It is also used when the researcher mentions some issues which will be discussed later, as in example [2], or when stating what the research paper will be about, as in [3].

[1] *...any reduction in interfacial free energy will reduce the driving force...*

[2] *The justification for our assignment will be discussed later.*

[3] *This report will summarize our work on studying the morphological...*

1.3.2 Be going to

The construction *be going to + infinitive* is another important way of expressing future events. This form is mainly used in informal spoken English (Leech 2004, 58). *Be going to* is used to express what someone intends to do in the near future and it also expresses that the situation is already on the way (Svoboda and Kučera 2003, 24). However, Leech (2004,

61) adds, that “be going to does not guarantee that the anticipated happening will actually come to pass”.

In academic English, this construction is used primarily when the researcher refers to a future research, as in example [1].

[1] *We are going to investigate this occurrence in a future study.*

2 RESEARCH PAPER

2.1 Research paper as a genre

According to Swales (1998, 93), the research paper is a written text that informs readers about some exploration that the author of the paper performed. In addition, the research paper not only informs about some research, but also describes the methodology used in the research process and compares the findings made by the researcher to the results of others. The research article is usually published in a research journal or it can appear in a book-length collection of papers, but it is not so common. Writing a research paper is a long process that requires many activities such as reading, researching, describing, informing, illustrating and persuading. In this process, the researcher learns “to think and write methodically and critically about a specific aspect of a subject, thus gaining deeper understanding of it” (Björk and Räisänen 1997, 233). The researcher also learns how to collect sources that are reliable for supporting the argument and the way of connecting his own results to already existing knowledge.

The research paper is basically an argument supported by thoroughly recorded evidence and that is what differentiates this genre from other academic writing. That means that the researcher’s main concern is to find a research problem that would be interesting to explore and then to build up a strong argument supported by reliable texts and accompanied by figures, field studies and theories derived from reading of other researches in the same field of study. Nevertheless, the writing of research paper is not only about reporting other people’s ideas. It requires also the researcher’s own interpretation of the issue (Björk and Räisänen 1997). The overall purpose of the research paper is to collect the information about the topic from other people and connect these pieces of knowledge together to provide a unique perspective of the issue (Baker and Brizee).

Swales (1998, 95) notes that the research article is such a huge genre that it has no rivals in printed medium in terms of the number of printouts. The only exception may be the news in newspaper.

2.2 History of the research paper

The scientific research paper appeared at the same time when the first scientific periodical called *The Philosophical Transactions of the Royal Society* was established, specifically in 1665 (Swales 1998). According to Ard (1983), this new genre of article was created from

the letters written by scientists, in which they informed each other about something. Therefore many of the early papers were written in the first person form that is associated with letters, and some of them even had the salutation 'Sir' at the beginning.

Then there was another intention to create a research paper that arose from the existing convention of publishing the scientific contracts. The researchers were trying to find a way how to make a generally-accepted knowledge from their speculations and statements (Shapin, 1984). However, not much of the first writings in the journal called *Transactions* appeared to be experimental reports. Before the year 1800 the experimental reports had created less than 40 percent of all of the published articles. The subject of interest in the early days was comprised mainly of reports about some natural disasters such as earthquakes, by various microscope observations, or others (Swales, 1998).

As Brazerman (1983, 5) states, then there was a shift in the concept of experiment from any created or made thing to an international investigation, for which a proof of a claim is necessary. Swales (1998, 113) notes, that in this process of development the scientist's view of the nature of things changed. In the beginning it was believed that by manipulated observation the scientist could reveal the nature of things, but later the belief was reached that the nature of things is difficult to get at. Due to this change, the focus was on the description of how the experiments were conducted, on the methods that were used for the study and the reasons for their selection, and on the detailed description and explanation of the results. Thanks to these developments, the concept of the research paper was reorganized at the end of the eighteenth century. Based on Brazerman (1983, 16-17), research articles began to adopt a different organization, beginning with an introduction to the problematic issue, continuing with describing experiments and ending with conclusions. In the twentieth century, the research paper stopped using the first person narrative and more formal approach began to be taken (Ard, 1983).

The textual development of the research paper in the twentieth century was investigated by an American educator and scholar Charles Brazerman, whose findings are summarized by Swales (1998). In terms of the article length, Brazerman (1984) claims, that in the period of years 1893 to 1900 the decrease in the average length of the article can be seen. Originally it was 7.000 words on average, but it decreased to 5.000 words. However, by the year 1980, an opposite effect could be seen; the number of words increased to 10.000 words and the average length of the article extended.

According to the non-verbal material of the research paper, Swales (1998, 115) notes, that during the investigated period, a decrease in the number and even the size of drawings and tables could be observed. Instead, the diagrams and equations became more complex and their usage increased. With regard to the organization of the research paper, before the year 1950 it was not common to divide the article into sections. Just about 50 % of articles contained this division; however, this trend changed after 1950 and the division of the article into sections became a regular feature.

2.3 Research papers in science and technology

Björk and Räisänen (1997, 311) point out that in science authors use writing for testing the ideas and for the creation of claims that might become general knowledge. More specifically, writing is used for the creation of the relationship between the original claim and the evidence that has been discovered to prove this claim. In this process researchers progress from describing concrete details of study to setting these details in larger context and make generalizations. The exploration in the field of technology and science is cumulative. It means that it is a complex prolonged process in which the researcher at first needs to go through the previous studies in the same field and learn the assumptions that have been accepted, then some new statements are created, but these have to be first carefully examined by the scientific community members and only after approving the statement it becomes general knowledge. To make sure that new claims are justified, the task of the referees, journal editors or other experts in the field is to guarantee that the particular researcher has proceed on the basis of the set methods, that the findings of the study are reliable and valid and could be subsequently used for wider applications.

According to Björk and Räisänen (1997, 317), the main body of the research paper in science and technology is traditionally divided into sections according to the pattern IMRAD. This acronym stands for **I**ntroduction, **M**ethods, **R**esults, **A**nd **D**iscussion. However, Swales and Feak (1994) call the pattern IMRD which stands for **I**ntroduction, **M**ethods, **R**esults, and **D**iscussion. These two patterns might look different, but after explaining what the abbreviations stand for, it is apparent that they are the same. Björk and Räisänen (1997) add that the division into sections with headings has become the conventional superstructure of the research paper and although these headings do not provide the reader with the information about the current content of the section, they serve

as a guideline for the readers who have experience with reading research papers, and as a help for finding the information that is being looked for.

Most of the research papers in science and technology are written for the purpose of enforcing an argument in order to make the achieved results valid or to support the previous theories or findings of others. Another interpretation of the purpose of the research paper can be to cast doubt on the previous results, carry out new research that proves that the existing results are incorrect and find new results supported by evidence. Research papers enable the formation of new knowledge, which is the most significant criterion for scientific research (Björk and Räisänen 1997).

2.4 Parts of the research paper and their features

As said before, every research paper is divided into several parts, each of which has its typical features. The paper usually begins with Abstract and ends with References. However, in this bachelor thesis the attention is paid only to the main body of the research paper. According to theory mentioned above, the division of the main body can be done according to the patterns IMRAD or IMRD. However, on the basis of our analysis, the most common division of the main body of the research paper is into these four parts: Introduction, Methods, Results and discussion, and Conclusion, IMR(D)C. Nevertheless, also other divisions can be found among the research papers. For example in some of them the section called Results and Discussion can be divided into two individual parts, one called Results and the other Discussion. Sometimes instead of Methods, the section is called Materials and methods or Experimental or even Experimental procedure, with the same content. However, these are just slight changes that do not affect the whole concept of the research paper.

According to Swales and Feak (1994), the shape of the research paper represents the general-specific-general movement. That means that in the part called Introduction the writer moves in thinking from general information to specific details. In other words, the author provides at first some background to the discussed topic, because not all of the readers of the research paper are familiar with the issue which the writer is going to discuss. On the other hand, in part called Conclusion the writer moves from specific to general information. This means that the author begins with explaining the details of what has been discovered in the research and then moves in thinking back to the generalization to summarize the results and make the conclusion. This is visualized in Figure 5. Notice

Results and discussion section, where a specific result is given first and then it is discussed to a certain degree, i.e. putting into more general context.

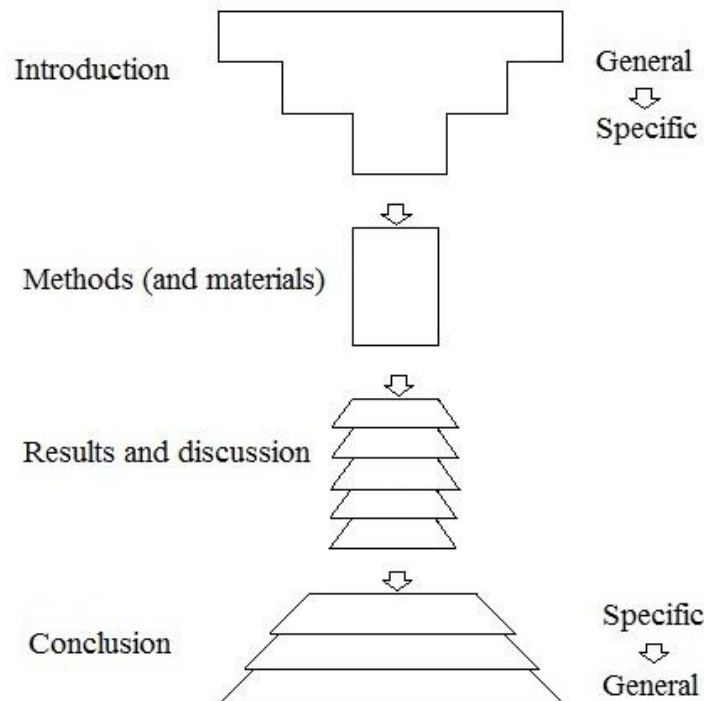


Figure 5: Overall shape of a research paper, *Based on Swales and Feak 1994, 157.*

2.4.1 Introduction section

Although Introduction is the first part of the research paper, it is usually the last section which the researcher creates, because it is not easy to write. The main aim of this section is to provide the reader with sufficient information about the background of the issue. This part usually provides brief information about the previous studies made on the current subject of investigation or the ideas that have influenced the current research process. Further it states the issue that will be dealt with in the paper and also the author's objective reasons for choosing the specific issue. In view of the fact that these days people generally use a lot of information, the purpose of the research and stating of main results could be also part of the Introduction section (Björk and Räisänen 1997, 320-321).

According to Swales and Feak (1994, 156), "The main purpose of the Introduction is to provide the rationale for the paper, moving from general discussion of the topic to the particular question or hypothesis being investigated", another purpose is to attract interest in readers.

John Swales (1998) has proposed, based on extensive research, a logical structure for the Introduction of the research paper. This structure is called the CARS model (**C**reate a **R**esearch **S**pace). In this model, the Introduction is divided into three moves, each of which may consist of several steps. In Move one the subject of study is defined together with the outline of the area of study, which is supposed to attract the attention and interest of readers. In this move the previous work on this subject is reviewed, which provides the reader the background information about the theory of the subject and about the course of the research so far. In Move two the subject of research is defined as a need to extend the existing area of knowledge of the subject of study, or to prove that in the previous study there is a drawback or contradiction that needs to be clarified. In Move three the author's specific research is presented (sometimes together with the description of the paper structure) and the aim of the paper. In some Introductions the main results are reported (Björk and Räisänen 1997, 321-22) but this is not usually done in papers with Abstract (then the results would be in Abstract, Introduction and in Conclusion).

In terms of the use of tenses in this part of the research paper, Swales and Feak (1994) point out that in Introduction the tense which has the highest occurrence is the present tense. Past tense appears in introduction with middle frequency and also present perfect can appear here. Björk and Räisänen (1997, 324) add that the past tense is commonly used when the author refers to other individual studies (see example [1]). The present perfect tense is usually used when the author mentions the area of study, as shown in example [2]; when referring to the general knowledge, the present tense is commonly used, as in [3].

[1] *Tan et al. developed a molecular composite...*

[2] *Physical properties and morphology in PBT have been studied by a variety of methods...*

[3] *Molecular nucleation occurs when chains melt...*

2.4.2 Methods section

The section called Methods is the second part of the research paper. It can be also called Experimental, or Materials and Methods, as already said. It is often the section which the author writes first, because it is the easiest one. This section provides the most facts and descriptions of all the sections of the research paper. The main task of this section is to

provide precise description of the methods and materials that were used for the research and the progress of the research itself. Generally, the description should enable someone else to repeat the research.

In the view of the fact that this section describes what happened in the past during the author's research, it is a commonplace to write this part in the past tense. Many methods in science and technology are well known procedures, which do not need an explanation because an experienced reader knows what the specific method stands for or it is a standard method, therefore it is enough just to leave a reference. Then there are other things that must not be forgotten. It is necessary to describe in detail the materials that were used in the research and also to clarify why they were chosen. At the beginning of this section usually the experiment is summarized in several sentences, as in example [1]. After that it is necessary to state all the information about the used material. At the end the procedure of how the experiment was undertaken is described (Björk and Räisänen 1997, 325-6).

According to the use of tenses in this section, Swales and Feak (1994) state that in this part of the research paper the tense with the highest frequency is the past tense, as in example [2]; on the other hand, the use of present tense is low and there is a very high occurrence of the passive voice, because the researcher concentrates on the process, as shown in example [3].

- [1] *Experimental studies were performed on a composite materials designed to meet specific service requirements by LLNL, including extended service life.*
- [2] *The semicrystalline TLCP used was a thermotropic...*
- [3] *Molecular composites were made from PPTA anion...*

2.4.3 Results and discussion section

According to West (1980, 486-7), this section informs about how the author processed the data collected in the research. The Results and discussion section is often subdivided into several subsections. In this section, the writer should describe the achieved results by the use of factual statements. If some of the statements are contradictory, the proper explanation of these claims should be provided. The results are compared with the assumptions acquired from the standard methods and by doing that they are validated (Björk and Räisänen 1997, 327). Here, the results should be clarified and connected with

the results of the previous works. Further, if there are differences between the previous and the current work, these should be explained and then a final conclusion should be made.

At the beginning of this section, the information about the researcher's specific work is provided and then this specific work is related to a wider theoretical framework. The researcher explains the research and validates the results.

The statements are often supported by figures, tables or graphs to make the information more relevant and easily understandable. The Results and discussion section should be concise and it should also state clearly the points of the research.

In terms of the use of tenses in this part, Swales and Feak (1994) note that the section called Results and Discussion has a high frequency of past tense and also the present tense is used quite frequently. The present tense is mainly used when referring to figures and tables that are present in this section, as in example [1]. The past tense is mainly used for describing the results obtained in the research carried out in the past, as in [2].

[1] *The DSC plots for neat PE and ... are presented in Fig. 1*

[2] *... the yield stress remained unaffected because...*

2.4.4 Conclusion section

Conclusion is the final part of the research paper. In this section the author consolidates the whole research and describes how the original statement of proposition is supported by the results of the research. One important rule for writing Conclusion is that in this section no new information should be presented (Björk and Räisänen 1997, 261). The aim of the Conclusion is, as the name indicates, to conclude the research by indicating the deductions derived from the Discussion and by making the topic of research generalized to a wider context (Björk and Räisänen 1997, 328). This section can appear separately in the research paper, or it can be merged with the section called Discussion. If the Conclusion appears separately, it can contain a list of statements that are numbered, but it is not always the rule.

According to the use of tenses in this part of the research paper, the tense with the highest frequency is the present tense, but the past tense can be also found there. The present tense is most commonly used to summarize the results, as in example [1], and the past tense is usually used to describe the concrete results in the current research, as in [2]. In describing what has been done in the research, present perfect is used [3].

- [1] *...during processing, the particles become aligned in the flow direction...*
- [2] *The oxygen plasma treatment caused surface roughness but did not degrade the bulk polymer.*
- [3] *We have synthesized and characterized a new family of...*

All in all, the research paper is a widespread genre not only in the field of science and technology and to write it is not easy. Beside the expert knowledge it requires a sufficient skill of the genre and content of each section of the research paper. Performing a research is a long process, during which it is necessary to find an issue which would be interesting to study, and which would have an asset for other researchers or the general public. The researchers who are writing this genre can follow the rules of Swales and Feak (1994) and Björk and Räisänen (1997) in terms of the use of tenses in its individual sections, however, it is not obligatory to stick to them.

3 SCIENCEDIRECT DATABASE

Because the research papers used in the analytical part of this thesis were obtained from the ScienceDirect database, in the following several words about its content, history, and technology are given.

ScienceDirect is a scientific database that contains journal articles and book chapters from more than 2,500 journals and 11,000 books (Elsevier B. V.). Currently this database contains more than 11 million articles, and its content base is fast growing. Every year nearly half a million journals issues or books are added into this database.

This database is a part of Elsevier, which is the largest provider of scientific, medical and technical information in the world. Thanks to this company, many articles dating back to the year 1823 were digitized and made available for readers. From the year 1991 to 1995, the company Elsevier with the help of eight universities took part in a project, where they were trying to find a way of creating a digital library. After four years of investment in technology they launched the database called ScienceDirect. The technology of this database is carefully developed so that the size of the data storage can be further extended. Therefore it is able to contain vast amounts of data (Elsevier B. V.).

In this database it is easy to search any needed information by typing the keywords or the name of the text, or even by the author of the article or book. However, not all articles are available for reading, some of them only offer an abstract of the text and if the reader is interested in full-text version, it is necessary to purchase the article or the book. Due to the quality of the research articles and the technological progress, the ScienceDirect is still the leading online database nowadays.

II. ANALYSIS

4 DESCRIPTION OF CORPUS

4.1 Polymer journal

Polymer is a journal for the science and technology of polymers (Elsevier B. V.), which focuses on publishing original research in polymer science and technology areas and puts emphasis on molecular or meso-scale interpretation of data. (Elsevier B. V.) It is published every two weeks.

This journal was chosen for the analysis of the use of tenses in individual parts of the main body of the research paper. This choice was made for two main reasons. Firstly it is a journal which focuses on technology, and secondly this is the one from the available journals that has the longest available history of publishing, reaching back to the year 1993.

In terms of the content of chosen articles, all of them are focused on the technology of polymers; however, each deals with a different issue. Among the issues belong the crystallization kinetics and structure development of vinylidene chloride/vinyl chloride copolymers, the use of thermotropic liquid crystalline polymers to reinforce thermoplastics, isothermal melt crystallization in poly (butylenes terephthalate) homopolymers and glass-fiber-filled composite, the cationic copolymerization of regular soybean oil, epoxy-aided dispersion of nanoclay particles in a glassy polymer, polymethylmethacrylate (PMMA), and others.

4.2 Articles chosen for analysis

For the searching of suitable research articles in technology an online database ScienceDirect was used. From this database the articles were carefully chosen with the proper IMR(D)C structure. In total, twenty articles were chosen from the journal Polymer. To make the examined sample more restricted, from each year in the period between 1993 and 2012 one article with the appropriate structure was chosen, and all chosen articles were written by authors from the United States of America. The length of the articles is on average nine pages. The longest article had fourteen pages, and the shortest had six pages.

It is necessary to say that not all of the twenty analyzed articles were processed. Although it was the original intention to analyze twenty articles, later it was decided that it would be better to take five most recent and five oldest articles from the twenty chosen ones in order to see if there are any changes in the use of tenses in the course of time.

The list of articles can be found in [References](#).

5 ANALYSIS OF CHOSEN ARTICLES

In this chapter the process of analysis will be described and then the results obtained will be presented.

5.1 Process of analyzing the research papers

The process of analyzing the articles was conducted as follows. First, each article was printed out so that it was possible to write in it. Then each of the articles was carefully read and during the process of intensive reading the verb tenses found in the text were highlighted in different colors to make it well-arranged and easier to count. Then for Introduction, Methods, Results and Discussion and Conclusion sections the number of individual tenses was calculated. The same process, which was very time demanding, was repeated for each of the twenty research papers.

The number of appearances of the tenses in individual sections of the research papers was then expressed in the form of graph (Microsoft Excel).

In the corpus, some of the analyzed research articles had the section Results and discussion divided into two separate sections, one called Results, and the other called Discussion. In this case, these two sections were joined together and the number of each tense from these two sections was added up to make the structure of all the tables the same.

5.2 Frequency of tenses in individual sections of the research paper

For the analysis of the use of tenses in individual parts of the research paper, five most recent and five oldest articles were taken from the total number of twenty analyzed research papers. The first analyzed group of articles, the oldest ones, consisted of papers from years 1993 to 1997. The second group of articles, concretely the group of the most recent ones, included articles from the period of 2008 to 2012. From both these groups of five articles an arithmetic mean of all the tenses was calculated separately and the results were expressed in percent. If some of the tenses was not present in an article, this tense was given a zero value. The results were then given into the table from which a bar diagram was created for each section of the research paper in each time group. The tenses detected in individual sections are demonstrated by examples taken from the analyzed papers.

5.2.1 Introduction section

Figure 6 shows that in Introduction the tense that has the highest percent of occurrence is the present simple tense in both analyzed periods. This result is coincident with the previous studies of Swales and Feak (1994), in which they state that the tense with the highest frequency in the section called Introduction is the present simple. Although the occurrence of this tense slightly decreased in the period from 2008 to 2012, it is still the prevailing tense in this section.

The second most frequent tense in this section is the past simple, which is also coincident with the theory that states that the past simple tense occurs in Introduction in middle frequency. According to Figure 6, the change between the two analyzed periods of time is, similarly to the change of the present tense, just slight. This change can be caused by the number of references to the previous studies of other researchers or even by the number of descriptions of what was done in these papers.

The tense that is the third most frequent is the present perfect tense. In previous publications of Swales and Feak (1994) it is stated that this tense can occur in this section of the research paper, but nothing about the frequency is stated there. Nevertheless, the usage of this tense has slightly increased in recent years, as apparent from the diagram. However, this slight increase does not mean that nowadays researchers use more present perfect tenses in Introduction section, this difference could be caused just by the number of references to previous studies that are used in this section, as in example [1]. Some researchers use a lot of references about what has been investigated and reported before, whereas others use it less frequently. It is also important to note that the change may be caused by the limited analyzed sample.

Another tense used in this section is the future simple tense. According to the diagram below it is apparent that this tense is not used frequently in this section, it is limited to cases when the author wants to write what will happen during the research, as shown in example [2].

Then there are tenses in the diagram that are approaching zero, such as the present continuous and the present perfect continuous. Each of these tenses was present just in one of the analyzed periods of time. These results therefore signal that these two tenses are only used occasionally. For example, the present continues is used when the author wants to stress that some process is taking place at the moment, as in example [3], and the present

perfect continuous can be used when some action started in the past, is still in progress and will be in motion in the future, as in [4].

- [1] *The physics of NR-melting has been summarized many years ago by Wunderlich...*
- [2] *The melting of lamellae will contribute to non-reversing melting...*
- [3] *The environment is being overwhelmed by nonbiodegradable, petroleum-based polymeric materials.*
- [4] *We have been developing molecular composites based on various ionic...*

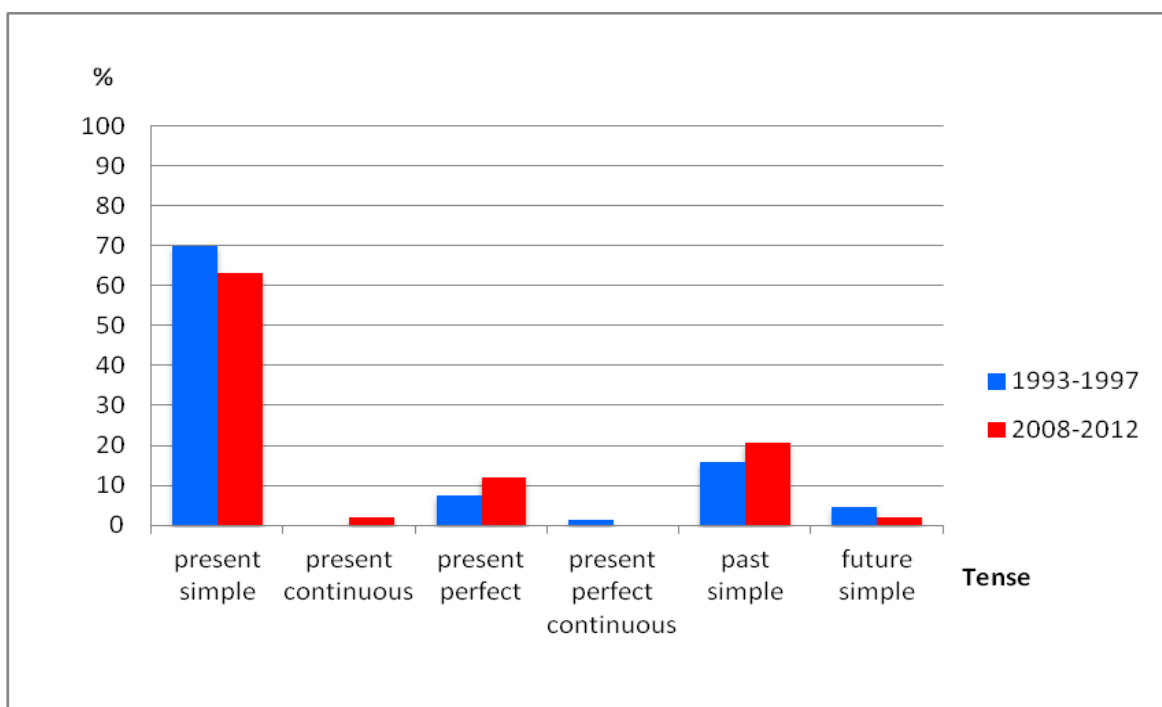


Figure 6: Occurrence of tenses in Introduction section

5.2.2 Methods section

As can be seen from Figure 7, the tense which is most frequently used in the Methods section is the past simple. This tense largely predominates over the other tenses appearing in this section. According to Swales and Feak (1994), the past simple tense has the highest frequency in the Methods section, so the results from the analysis of this section corresponds with the previous studies. The use of the past simple tense is in both analyzed periods of time so high because this section of the research paper mainly focuses on describing the experimental set-up and the materials that were used for the research, see example [1]. These are some specific events that happened in the past, therefore the past tense is logically used to express these events. The change between the two analyzed period of years from 1993 to 1997 and from 2008 to 2012 is only modest. Therefore this subtle difference does not have any significant meaning. This change may depend on how extensive the research process was. For example, if the research issue was vast, it will need more methods and materials for resolving the problem. Therefore, in such a section of the research article, more past tense will be used. On the other hand, if the research was not so extensive, less methods and materials will be used in order to achieve the results. It may also depend on the type of methods used in the research. If they were generally known methods, they would not need any explanation because everybody knows how the method was conducted; however, if some unknown methods were applied in the research, these would need a proper explanation of the process.

Then the present tense occurs in this section of the research paper, even though not as frequently as the past simple tense. In previous studies Swales and Feak (1994) claim that the use of the present simple tense in this section is low. The results from our analysis of this section confirm this statement. The use of present tense here is really low in comparison with the past simple tense, however, that may again be caused by the fact that this section of the research paper describes the events in the past, as already said. The change between the two analyzed periods of time is again only slight. As could be seen from the graph, in recent years the use of the present simple tense has decreased, compared to the period of 1993 to 1997. This decrease could be caused by the fact that more attention is paid in this section to what was done in the research, which is stated in the past tense, than e.g. what it is caused by, which is stated in the present tense, as in example [2]. The present tense is mainly used in Methods to refer to tables or diagrams/graphs/figures present in this section, as in

example [3], to explain the process of measurements, to give an explanation of individual variables in a formula, as in example [4], and to state general facts. It is again important to mention that the analyzed sample was quite limited and therefore the difference may not be as significant as they would have been if more articles had been used for the analysis.

The other tenses that are present in the diagram have so small percentage of occurrence that it is not relevant to deal with them.

- [1] *A two-step crystallization experiment was used to study nucleation.*
- [2] *... the higher crystallinity increases modulus and yield stress, and reduces toughness.*
- [3] *The chemical structure of the copolymer is shown in Figure 1 and the structural characteristics of the five samples are summarized in Table 1.*
- [4] *... K is the consistency coefficient and n is the flow behavior index.*

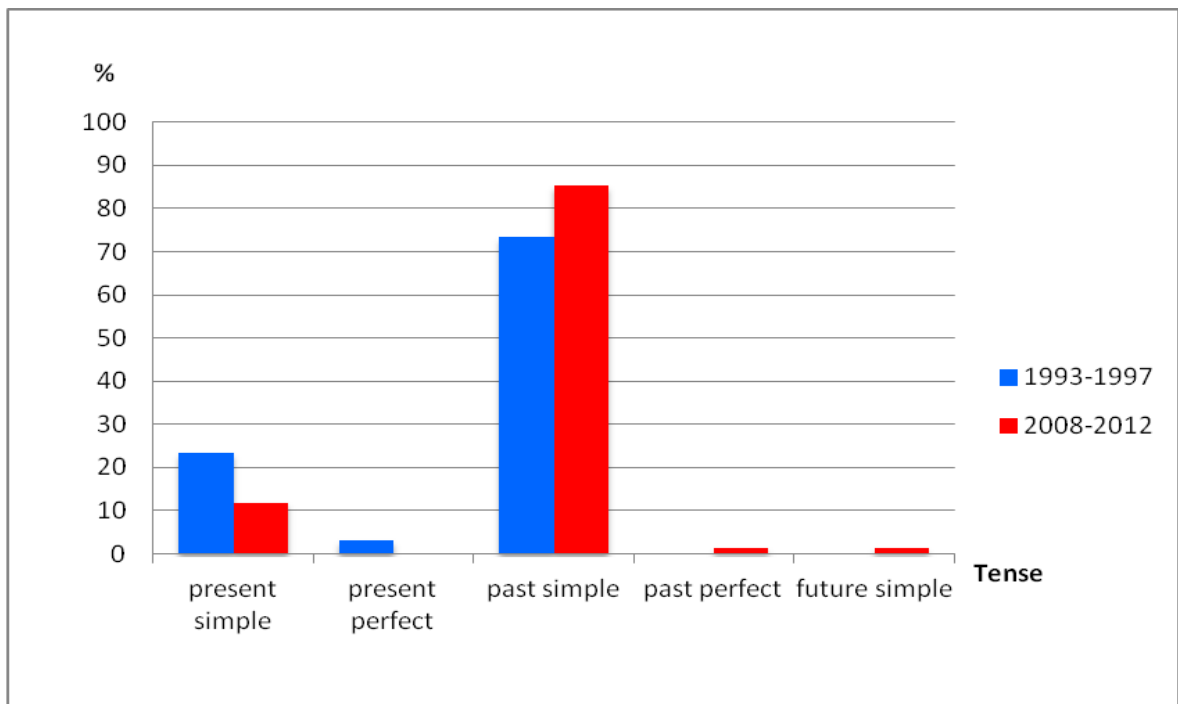


Figure 7: Occurrence of tenses in Methods section

5.2.3 Results and Discussion section

The diagram below (Fig. 8) presents large variations in the use of tenses in this section. As can be seen, the most frequently used tense in this part is the present simple. In the first studied period the value of the use of this tense was 80 %, i.e. almost all this section was written in the present simple tense. According to the previous studies of Swales and Feak (1994), the tense that has the highest occurrence in this section is the past simple. However, this result does not correspond with the analysis. The diagram clearly displays that the most frequently used tense is the present simple for both of the analyzed periods of time. In the first analyzed period, the present simple had a really high value, as said above while in the second analyzed period the present simple was used in 51 %. It means that in recent years the present simple tense was used rather less frequently than in the old period. The explanation of this change could be that the analyzed recent research papers focus more on the results of the research carried out in the past (written in the past tense), as shown in example [1], rather than on the discussion of the results that is written in the present simple tense. The present tense is commonly used for the data commentary, such as charts and tables that are located in this section, as in [2].

Another tense used in this section is the past simple. This tense should be prevailing in this section, but as apparent from the diagram, it is on the second place in terms of frequency. Furthermore, a big change between the analyzed periods could be seen there. While in the first period the past simple tense was only used in 14 %, in the second analyzed period the value was 45 %. It means that in the recent years, the use of the past simple tense increased by more than 30 %. What is also interesting is the difference between the present simple and the past simple tense. In the second analyzed period the use of the present simple and the past simple tense differed only by 6 %, while in the first period the difference between these two tenses was much more significant - 66 %. The reason for the increased usage of the past simple tense could be, as mentioned before, that in this section, the authors focus more on describing the results obtained in measurements, which are written in the past simple tense.

The rest of the tenses present in this section have such a low percentage of use that it is not worth to deal with them.

[1] *The elastic modulus increased from ... to ... however, the yield stress remained unaffected because of...*

[2] *The tensile modulus and yield stress data are listed in Table 1.*

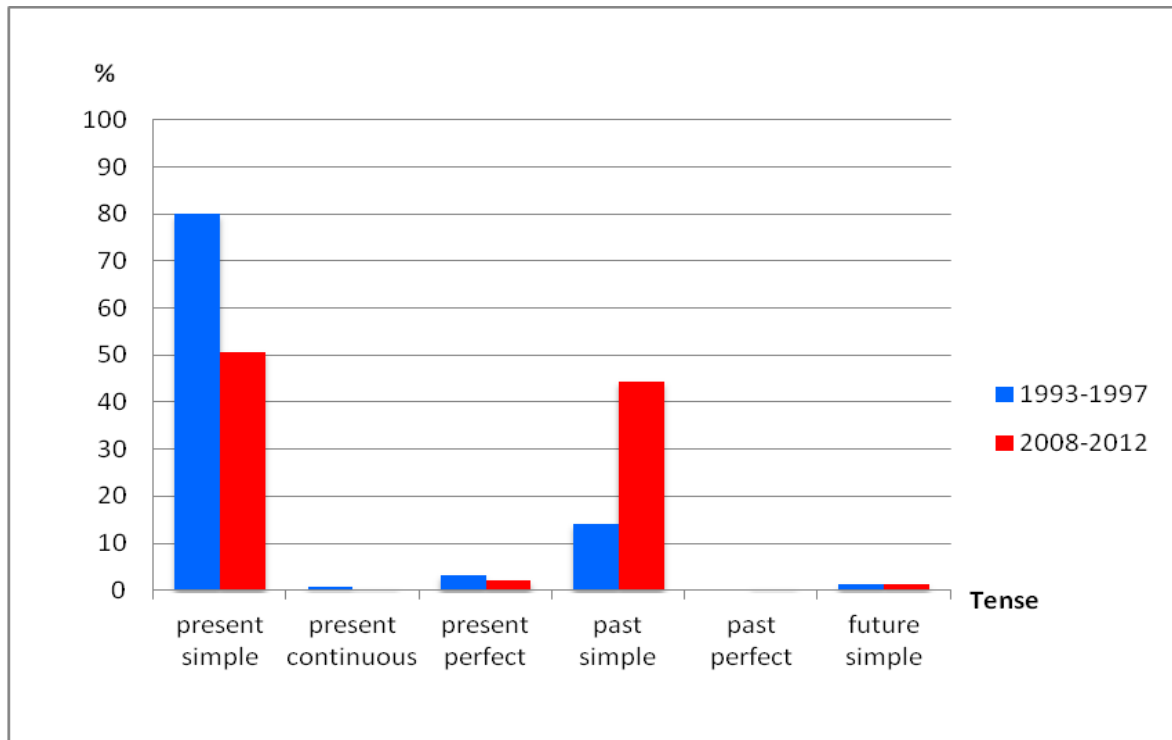


Figure 8: Occurrence of tenses in Results and Discussion section

5.2.4 Conclusion section

Frequency of tenses in Conclusion is depicted in Figure 9. It is apparent that almost all the tenses appear in this section. According to the previous studies of Swales and Feak (1994), the tense which is most frequently used in this section should be the present simple tense. In this case, the previous studies are coincident with our analysis. The present simple is the predominant tense in this section. In the period of 1993 to 1997, the present simple is used in 43 %, and in the other period, it has the value of 41 %. So the difference in time is very slight, therefore it is not considered significant. The present simple is used in this section to give the text general validity, as in example [1]. The findings written in the present tense seem to be more important than those in the past tense, which are only relevant for the specific research.

The second most frequent tense is the past simple according to Swales and Feak (1994). However, the results of our analysis show that the past simple tense was on the second place only in the latest years, with the value of 38 %. Compared with the present simple tense in the same period, the difference between these two tenses was very slight – 3 %. So in this period of time, the present simple and past simple are nearly on the same level. On the contrary, at the old period, the difference between the present simple tense and the past simple tense is much bigger, concretely 21 %. This large difference might be caused by the fact that in the first analyzed period, the authors used more present tense to give their findings more importance, and the past tense was used mainly to refer to the process of the research, while in the second analyzed period the researchers focused on both, the process of the research and writing the results in the present tense to make them general knowledge.

In the period of 1993 to 1997 the past simple was not on the second place, but only on the third place. The reason for this could be that in this period the authors focused more on presenting what has been observed, shown, and what have occurred during the research and have consequences in the present, which is expressed in the present perfect tense, as shown in example [2], while in the period from 2008 to 2012, the authors concentrated more on what happened during the experiments and describe the results in the past tense. It is also important to remember that the analyzed sample of research papers was limited; if more articles were analyzed, other results might be seen.

Another tense identified in this section, as already mentioned above, is the present perfect tense, which was second in frequency in the old period, but third in the latest period.

The change between the two times is by 16 %. This decrease in the use is probably caused by the fact that the researchers in the recent years rather use the past tense for describing the results of experiments.

It is also interesting to discuss the relation between the present perfect and past simple tense. While in the first analyzed period these tenses had almost the same frequency, in the other analyzed period there was quite a large difference between these two tenses. The reason for this variation may be that in the second analyzed period the authors focused more on the process of actions and on concrete results in the current research, which are written in the past tense while in the first analyzed period they concentrated on both the description of results and comments on the reactions that took place in the past but have consequences in the present.

Another tense that is used in this section is the future simple tense. It is mainly used for stating that more studies will be needed in future, or for describing what will the results be useful for. In the first studied period this tense was used in 9 %, while in the latest period it was used in 5 %, which means that the occurrence of the future simple tense slightly decreased in the recent period. The reason for this slight decrease could be that in the analyzed recent articles, the researchers focus more on the results of the research themselves than on what they will be used for. Another reason might be that the future tense indicates future research. However, we must keep in mind that if the author offers the idea for future research, other researcher could compete with the idea and gain grant money. That might be the reason why the authors nowadays do not write about future research as much.

The last tense that occurred in the analyzed articles is the present continuous tense, although it occurred only in the period of 2008 to 2012. The present continuous was used mainly to state what the researchers are currently investigating in an ongoing study, as in example [3]. This is related to the information mentioned before. The present continuous tense may have replaced the future simple tense for the planned studies; it applies to the started research, now in progress. All in all, this tense is not frequently used in the Conclusion section; in the period from 1993 to 1997 it has even a zero occurrence.

- [1] *Both long period and lamellar thickness increase when the molecular weight increases...*

[2] *Therefore, PEI/Vectra A blends have shown, at these concentrations, considerably higher values of tensile strength than...*

[3] *We are currently investigating this possibility in an ongoing study.*

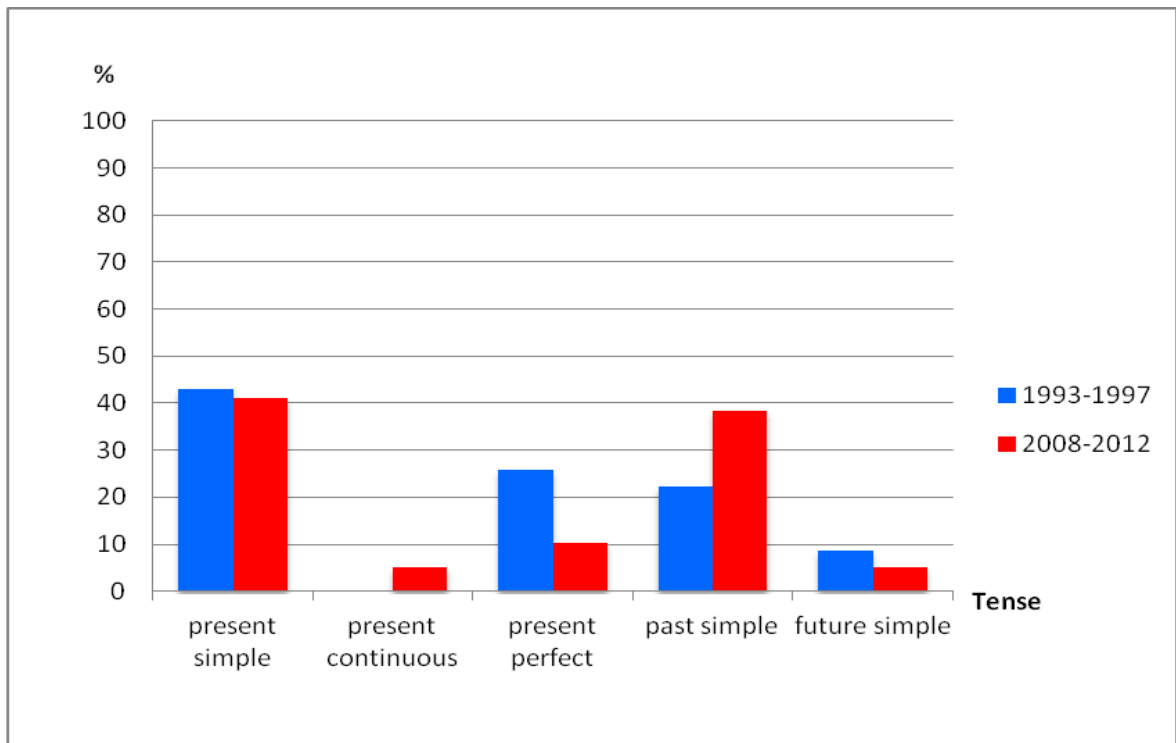


Figure 9: Occurrence of tenses in Conclusion section

To conclude this chapter, every section of the main body of the research paper has its own rules for the use of tenses with some level of freedom. Based on the previous studies of Swales and Feak (1994), there are certain assumptions for the frequency of tenses in individual sections. According to our analysis, some of these assumptions agree with the theory, while others do not. The differences between the previous research and our analysis, and even between the two analyzed periods of time may be partially caused by the limited number of analyzed sample. There is a probability of finding other results if more articles are analyzed.

CONCLUSION

The aim of this thesis was to analyze the usage of verb tenses in individual parts of the main body of chosen technology research papers in the range of twenty years, and to compare the results with theory. Another aim was to find out whether the tense occurrence in individual parts of research papers has been changing in the course of time or not.

On the basis of the analysis we can conclude that not always is the theory coincident with the practice. In the sections called Introduction and Methods, the theory agreed with the practice, however, in the Results and discussion section the counts from the analysis were different from the theory. Moreover, in Conclusion section, the present simple tense agrees with theory, but the past simple tense is coincident just in one analyzed period of time. When looking at the tenses in terms of the two analyzed periods of time, some changes can be seen in every diagram. Some of them are only modest, which signals that the difference may be caused by the limited analyzed sample. Nevertheless, there are some big changes between the two analyzed periods which can be caused by many factors, such as the number of references to the previous studies in the case of the past simple tense, the number of references to future research in the case of the future tense, and other potential reasons stated above.

It should be stressed once again that this study has examined only a limited sample of research papers. To make the results more general and applicable, the research sample would have to be much larger, in a size beyond the scope of a bachelor thesis. Notwithstanding the limitations of this pilot study, the information presented here should be useful for researchers who are constructing research papers in this area of science and technology.

BIBLIOGRAPHY

- APA. 2001. *Publication manual of the American psychological association*. Washington, DC: American psychological association.
- Ard, Josh. 1983. The role of the author in scientific discourse. Paper given at the annual American Applied Linguistics Meeting, Minneapolis, Minn, December, 1983.
- Baker, Raymond Jack, and Allen Brizee. Genre and the Research Paper. Purdue OWL. <http://owl.english.purdue.edu/owl/resource/658/02/> (accessed February 18-26, 2013).
- Bem, Daryl J. 2003. Writing the empirical journal article. In J. M. Darley, M. P. Zanna, & H. L. Roedriger, III (Eds.), *The compleat academic: A practical guide for the beginning social scientist*. Washington, DC: American psychological association.
- Björk, Lennart A., and Christine Räisänen. 1997. *Academic writing: A university writing course*. Brombley: Chartwell-Bratt.
- Brazerman, Charles. 1983. Reporting the experiment: the changing account of scientific doings in the *Philosophical Transactions of the Royal Society*, 1665-1800 (mimeo).
- Brazerman, Charles. 1984. Modern evolution of the experimental report in physics: spectroscopic articles in *Physical Review*, 1893-1980. *Social Studies in Science* 14, 163-96.
- Burrough-Boenisch, Joy. 2003. Examining present tense conventions in scientific writing in the light of reader reactions to three Dutch-authored discussions. *English for specific purposes* 22, no. 1. <http://www.sciencedirect.com/science/article/pii/S0889490601000497> (accessed April 7, 2013).
- Day, R. A. 1995. *Scientific English: A guide for scientists and other professionals*. Phoenix, AZ: Oryx.
- Dušková, Libuše, Libuše Bubeníková, and Jan Caha. 2006. *Stručná mluvnice angličtiny*. Praha: Academia.
- Elsevier B. V. About ScienceDirect. <http://www.info.sciverse.com/sciencedirect/about> (accessed April 21, 2013).
- Elsevier B. V. Platform Brochure. http://www.info.sciverse.com/documents/files/content/pdf/SDPlatformBrochure_06.pdf (accessed April 21, 2013).

- Elsevier B. V. Polymer. <http://www.journals.elsevier.com/polymer/> (accessed April 8, 2013).
- Elsevier B. V. ScienceDirect. <http://www.sciencedirect.com/> (accessed September 15, 2012 – April 21, 2013).
- Greenbaum, Sidney. 1996. *The oxford English grammar*. New York: Oxford University Press.
- Huddleston, Rodney, and Geoffrey K. Pullum. 2002. *The Cambridge grammar of the English language*. New York: Cambridge University Press.
- Leech, Geoffrey Neil. 2004. *Meaning and the English verb*. London: Pearson Education Limited.
- Quirk et al. 1985. *A comprehensive grammar of the English language*. Harlow, Essex: Longman.
- Salager-Meyer, F. 1992. A text-type and move analysis study of verb tense and modality distribution in medical English abstracts. *English for specific purposes* 11, no. 2: 93-113.
- Shapin, Steven. 1984. Pump and circumstance: Robert Boyle's literary technology. *Social Studies of Science* 14, 481-520.
- Svoboda, Aleš, and Karel Kučera. 2003. *English parts of speech*. Opava: Slezská univerzita v Opavě.
- Swales, M. John. 1998. *Genre Analysis: English in academic and research settings*. Cambridge: University Press.
- Swales, M. John, and Christine B. Feak. 1994. *Academic writing for graduate students: A course for nonnative speakers of English*. Michigan: The University of Michigan Press.
- Taylor, G. 1989. *The student's writing guide for the arts and social sciences*. Cambridge: Cambridge University Press.
- Tseng, Fan-ping. 2011. Analyses of move structure and verb tense of research article abstracts in applied linguistics journals. *International journal of English linguistics* 1, no. 2 (September).
<http://www.ccsenet.org/journal/index.php/ijel/article/view/10189/8499> (accessed April 8, 2013).
- Waard, de Anita, and Henk Pander Maat. 2012. Verb form indicates discourse segment type in biological research papers: Experimental evidence. *Journal of English for academic*

purposes 11, no. 4 (December).

<http://www.sciencedirect.com/science/article/pii/S1475158512000471> (accessed April 6, 2013).

West, Gregory. K. 1980. That-nominal constructions in traditional rhetorical divisions of scientific research papers. *TESOL Quarterly* 14:483-9.

List of analyzed articles:

Brown, Eric N., and Dana M. Dattelbaum. 2005. The role of crystalline phase on fracture and microstructure evolution of polytetrafluoroethylene (PTFE). *Polymer* 46, no. 9 (April). <http://www.sciencedirect.com/science/article/pii/S0032386105001096> (accessed September 15, 2012 – April 21, 2013).

Cipriano et al. 2008. Conductivity enhancement of carbon nanotube and nanofiber-based polymer nanocomposites by melt annealing. *Polymer* 49, no. 22 (October). <http://www.sciencedirect.com/science/article/pii/S003238610800743X> (accessed September 15, 2012 – April 21, 2013).

Cureton et al. 2010. Synthesis and characterization of hexafluoroisopropylidene bisphenol poly-(arylene ether sulfone) and polydimethylsiloxane segmented block copolymers. *Polymer* 51, no. 8 (April). <http://www.sciencedirect.com/science/article/pii/S0032386110001291> (accessed September 15, 2012 – April 21, 2013).

Gee, Richard H., Robert S. Maxwell, and Bryan Balazs. 2004. Molecular dynamics studies on the effects of water speciation on interfacial structure and dynamics in silica-filled PDMS composites. *Polymer* 45, no. 11 (May). <http://www.sciencedirect.com/science/article/pii/S0032386104002836> (accessed September 15, 2012 – April 21, 2013).

Gunderson, J. J., and G. A. Von Wald. 1993. Crystallization kinetics of vinylidene chloride/vinyl chloride copolymers. *Polymer* 34, no. 10. <http://www.sciencedirect.com/science/article/pii/003238619390749Z> (accessed September 15, 2012 – April 21, 2013).

Hsiao et al. 1999. Time-resolved X-ray studies of structure development in poly(butylene terephthalate) during isothermal crystallization. *Polymer* 40, no. 12 (June). <http://www.sciencedirect.com/science/article/pii/S0032386198005734> (accessed September 15, 2012 – April 21, 2013).

- Kriegel et al. 2009. Electrospinning of chitosan-poly(ethylene oxide) blend nanofibers in the presence of micellar surfactant solutions. *Polymer* 50, no. 1 (January).
<http://www.sciencedirect.com/science/article/pii/S0032386108008471> (accessed September 15, 2012 – April 21, 2013).
- Laicer, Castro S.T., Randy A. Mrozek, and T. Andrew Taton. Domain nucleation dictates overall nanostructure in composites of block copolymers and model nanorods. *Polymer* 48, no. 5 (February).
<http://www.sciencedirect.com/science/article/pii/S0032386107000171> (accessed September 15, 2012 – April 21, 2013).
- Li, F., M. V. Hanson, and R. C. Larock. 2001. Soybean oil-divinylbenzene thermosetting polymers: synthesis, structure, properties and their relationships. *Polymer* 42, no. 4 (February). <http://www.sciencedirect.com/science/article/pii/S0032386100005462> (accessed September 15, 2012 – April 21, 2013).
- Liang et al. 2011. Toughening vinyl ester networks with polypropylene meso-fibers: Interface modification and composite properties. *Polymer* 52, no. 2 (January).
<http://www.sciencedirect.com/science/article/pii/S003238611001061X> (accessed September 15, 2012 – April 21, 2013).
- Park, Jong Hyun, and Sadhan C. Jana. 2003. The relationship between nano- and micro-structures and mechanical properties in PMMA-epoxy-nanoclay composites. *Polymer* 44, no. 7 (March).
<http://www.sciencedirect.com/science/article/pii/S0032386103000752> (accessed September 15, 2012 – April 21, 2013).
- Parker, G., and M. Hara. 1997. Melt-processable molecular composites via ion-dipole interactions: Poly(p-phenylene terephthalamide) (PPTA) anion and poly(vinylpyridine)s. *Polymer* 38, no. 11 (May).
<http://www.sciencedirect.com/science/article/pii/S0032386197856042> (accessed September 15, 2012 – April 21, 2013).
- Ruckenstein, Eli, and Yumin Yuan. 1998. Colloidal scale blends of poly (p-benzamide) with sulfonated polystyrene and poly (vinyl acetate). *Polymer* 39, no. 5 (March).
<http://www.sciencedirect.com/science/article/pii/S0032386197004047> (accessed September 15, 2012 – April 21, 2013).
- Sauer et al. 2000. Temperature modulated DSC studies of melting and recrystallization in polymers exhibiting multiple endotherms. *Polymer* 41, no. 3 (February).

- <http://www.sciencedirect.com/science/article/pii/S003238619900258X> (accessed September 15, 2012 – April 21, 2013).
- Song et al. 1994. Rod aggregation in graft rigid-rod copolymers for single-component molecular composites. *Polymer* 35, no. 4.
<http://www.sciencedirect.com/science/article/pii/0032386194908613> (accessed September 15, 2012 – April 21, 2013).
- Sousa, de J. P., and D. G. Baird. 1996. In situ composites based on blends of a poly(ether imide) and thermotropic liquid crystalline polymers under injection moulding conditions. *Polymer* 37, no. 10 (May).
<http://www.sciencedirect.com/science/article/pii/0032386196873174> (accessed September 15, 2012 – April 21, 2013).
- Tanniru, M., Q. Yuan, and R. D. K Misra. 2006. On significant retention of impact strength in clay-reinforced high-density polyethylene (HDPE) nanocomposites. *Polymer* 47, no. 6 (March). <http://www.sciencedirect.com/science/article/pii/S0032386106001108> (accessed September 15, 2012 – April 21, 2013).
- Tchoul et al. 2012. Enhancing the fraction of grafted polystyrene on silica hybrid nanoparticles. *Polymer* 53, no. 1 (January).
<http://www.sciencedirect.com/science/article/pii/S0032386111009499> (accessed September 15, 2012 – April 21, 2013).
- Thongruang, Wiriya, Richard J. Spontak, and C. Maurice Balik. 2002. Correlated electrical conductivity and mechanical property analysis of high-density polyethylene filled with graphite and carbon fiber. *Polymer* 43, no. 8 (April).
<http://www.sciencedirect.com/science/article/pii/S0032386102000435> (accessed September 15, 2012 – April 21, 2013).
- Whang et al. 1995. A novel method to fabricate bioabsorbable scaffolds. *Polymer* 36, no. 4.
<http://www.sciencedirect.com/science/article/pii/0032386195931153> (accessed September 15, 2012 – April 21, 2013).

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