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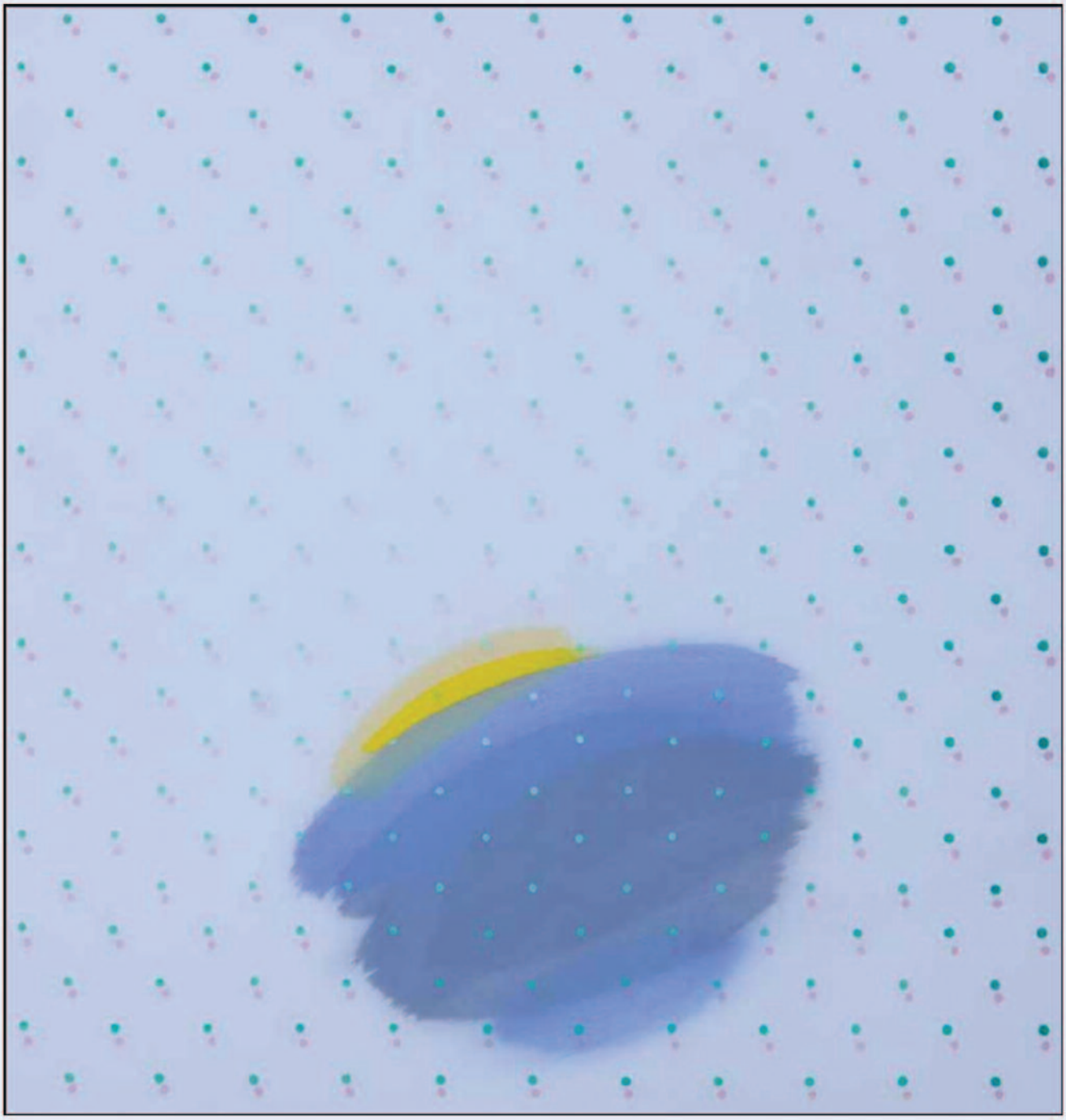

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Mother Teresa University in Skopje,
Republic of North Macedonia
12 UdarnaBrigada 2a/ VII, Skopje, North Macedonia
Phone: +389 2 3161 004
E-mail: seejsd@unt.edu.mk
Web: www.seejsd.unt.edu.mk

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EDITOR'S MESSAGE

The world of scientific heritage is permanently growing and even in the modern information society it is very difficult to follow the trends in scientific disciplines. The most important traces of each contribution in filling this "ocean" of knowledge are scientific publications. More than three and a half centuries passed since the first scientific journals were published. Currently, there are thousands of scientific publications dealing with all different aspects of research, containing infinite dates which serve as a crucial basis for further SUSTAINABLE DEVELOPMENT of the human civilization.

Those publications have surpassed any ownership and crossed over the borders of the places where they were produced and emerged to build solid research in the interest of the advancement of the needs and interests of humankind.

Continuing with the third issue, International Scientific Journal "South East European Journal for Sustainable Development (SEEJSD) slowly but surely is establishing as a messenger between the scientific community and the society in order to promote, present and wide the new scientific findings, innovations and research methodologies.

The editorial board of the SEEJSD, composed by researchers, experts and young scholars of various fields relevant to sustainable development, took the responsibility to consolidate and advance the content and quality of the Journal, to increase its scientific credibility and to align it in accordance with the international requirements. On its behalf I would like to express sincere gratitude to all authors and coauthor in different fields and formats for their contributions that have passed through critical peer-review process and are part of the issue that is in front of you.

This issue is a follow up story of the International conference "Toward Sustainable Development" organized in November 2108. Some of the most relevant papers presented during the mentioned conference are part of this issue. There is a review paper related to the importance of didactic training in academic institutions, followed by few original scientific and professional papers, finishing with some case studies from various areas that have an impact on sustainable development. We are also convinced that this kind of scientific platform will affirm the new scientists and enthusiasts to engage them in international theoretical and empirical debates.

The other challenge in front of the editorial board is indexation and involvement of SEEJSD in the group of serious, recognizable and high impact journals. We are aware that it can take some time, but if we are following the precise and competitive rules in our Guideline, we are sure that the next issues of SEEJSD could be indexed in prominent database like Web of Science, Scopus or Thomson Routers.

At the end, let me express my optimism that we are on a good track to become equal player in the worldwide game named as science.

Editor in Chief,
Prof. Aziz Pollozhani, PhD

DIDACTICAL IN-SERVICE TRAINING OF ACADEMIC STAFF AS A CONDITION FOR QUALITY ASSURANCE IN TERTIARY EDUCATION

ZORAN T. POPOVSKI[1]
Ss Cyril and Methodius" University, Faculty of Agriculture and Food Sciences, Skopje, Republic of North Macedonia, zoran_popovski@yahoo.com

AZIZ POLLOZHANI[2]
"Mother Teresa" University, Faculty of Technological Sciences, Skopje, Republic of North Macedonia, a.pollozhani@unt.edu.mk

ABSTRACT

The global expansion of university education and increased pressure on universities to enhance economic and social development has called for efficiency and effectiveness in university education systems. In the context of the current reform of the high education and considering the Bologna Declaration, it is obvious that contemporary university teaching is interactive in which the relation between the students and teachers is defined as partnership. In that sense, European Higher Education Area has made the development of teaching skills among teaching staff a priority.The importance of teaching competencies among teaching staff is often downplayed as compared to that of research competencies, with the latter, and not the former, often being considered as a criterion for career advancement at the university.In the Republic of Macedoniahas never been established a system which should provide systematic achieving of experiences and skills related to the teaching process for the academic staff. One of the integrative functions of the Universities should be organization and maintenance of this system. For such purposes in the frame of Mother Teresa University was established Center for Educational Policies and Training (CEPT) where already have started concrete activities by organizing seminar for modern trends in academic teaching and workshop for preparation of study programs and syllabuses in cooperation with prominent international partners. There are still opened issues related to legal status of CEPT, sustainable financial support, appropriate human resources which need to be solved as soon as possible in order to avoid any improvisation and its devaluation.

Key words: didactic competences, training, academic stuff, quality assurance, universities

1. BACKGROUND

The teaching competence of educators in all levels of education is of a great importance in the modern knowledge based society. Such competences of teachers in primary and secondary schoolsare precisely defined, while the competencies required for career development of academic staff is minimal or none. The importance of teaching competencies among teaching staff is often downplayed as compared to that of research competencies, with the latter, and not the former, often being considered as a criterion for career advancement at the university. Observations revealed that in Europe in particular, academics were not as prepared for their teaching career as they were for research [1]. A pedagogically competent university teaching staffneeds to possess not only an excellentbackground and experience in appropriate scientific field, but also pedagogi-

cal knowledge and skills. Those things combined withcertain personality and quality traits are kind of guarantee for high level of quality assurance in teaching process.

Higher education institutions must ensure a minimum competency of teachers inorganizing and teaching, because a highlevel of scientific expertise doesnt mean also a high level of instruction. The fact isthat the difference is something to know and be able to teach, even should recognizethe difference between knowing how to teach and be able to teach successfully [2]. Such educatorswouldcritically evaluatethemselves and their teaching practices, trying to change and improve their educational skills, at the same time creating a stimulative atmosphere, that derive satisfaction from their work. In that case they can rightly expect the outcomes of their work, expressed in terms of their students' achievements and progress [3]. Education has experienced a pedagogical shift, in the 21st century, from being teacher-centered to student-centered.

Teaching influences students' learning and is considered to be a profession requiring specialized knowledge acquired through both training and experience [4].

Contemporary university teaching in the process of implementation of principles based on the Bologna Declaration is between traditional and contemporary paradigm of high education. Rethinking of the existing didactic-methodological organization in the tertiary education as well as the role of students and University lecturers is a result of the current process of higher education reforms. In the context of the current reform of the high education and considering the Bologna Declaration, it is obvious that contemporary university teaching is interactive in which the relation between the students and teachers is defined as partnership [5].In relation to this, methodic organization of teaching in which a special accent is put on teaching aids, didactic media and teaching technology is of existential value to sustainability of contemporary university courses. Results from many studies shows that contemporary university teaching is dominated by combining of teaching aids, that laptop and projector are dominant didactic media that characterize contemporary university courses [6].

The UIS depicted the global student population as having increased by 143% over a 18-year span running from the year 1991 (68 million students) to the year 2009 (165 million students). With the global rapid increase in student population and universities there has been an increased demand formechanisms to ensure quality university education [7].

The global expansion of university education and increased pressure on universities to enhance economic and social development has called for efficiency and effectiveness in university education systems [8]. According to Liakopoulou[9], there was need for a professional competency framework of evaluation of teaching. Course and program evaluation is a vital component of determining the effectiveness of instruction in influencing the students' learning. A study to critique the methods used to evaluate the competencies of lecturers carried out by Nakpodia [10] revealed one of the weaknesses of the instrument as that of giving little focus to the competencies in teaching, despite excellence in academia. It was found that more focus was given to aspects such asmain duties, researches, ad-hoc duties, scholarly activities such as seminar, conferences, workshops, and courses attended and, publications at the expense of competencies in teaching.

According to Acker and Haque [11] in Canada, competencies in production of publica-

tions were of greater concern to doctoral students who were teaching in the university as compared to competencies in teaching, which were considered to be attainable through experience on the job. Berthiaume [12] also observed that teaching staff in higher education were trained for many years in their subject area and research and, in most cases, not at all in teaching, yet teaching occupied the teaching staff most in their academic career. Taking cognizance of the Bologna process that recognized the need for improved teaching, the European Higher Education Area has made the development of teaching skills among teaching staff a priority. This endeavor is being adopted in other areas of the world.

One of the most strongly validated, robust and reliable instrument for evaluating students' experiences in courses and programs of study internationally is theCourse Experience Questionnaire (CEQ), which was developed by Ramsden in 1991 [13] as a performance indicator for monitoring the quality of teaching on individual academic programs at Australian universities. The questionnaire consisted of thirty items in five scales, which were notably the 'goodteaching', 'clear goals and standards', 'appropriate workload', 'appropriate assessment' and 'emphasis on independence' scales. Taking cognizance of good practices, program and course evaluation instruments in the universities should be designed in a manner that reflects the five scales of CEQ. Results of such evaluation instruments should be effectively utilized in enhancing the professionalcompetencies of the teaching staff of the university.

Universities' jobadvertisements revealed academic qualifications, teaching experience, research, publications and attendanceof conferences, seminars and workshops to be prerequisites to teaching at the university. However, little emphasis isgiven to the didactic competencies required at the university.Theresults of some studies revealed that a low percentage of teaching staff considered didactic competencies as an achievementarea in the teaching profession. There was need for advocacy andsensitization of teaching staff and university management on the importance of the three types of didacticcompetencies in the enhancement of the quality of teaching and learning at the university.

Many universities have shifted focus from passive learning, which relates to surface learning approaches, to active learning, engaging students in deep approaches to learning [14]. Independent, creative and critical thinking has been encouraged among the students. The students' learning outcomes have been considered to depend on their own effort and activities, which they direct and are responsible for [15]. On the other hand, the role of the teaching staff has shifted to one of providing support to the student in their learning process and creating a learning environment oriented towards deep learning approaches [16].

Three types of teaching competencies that have been greatly considered by various authors are professional attitudes, didactic competencies and subject matter competencies [17]. Professional attitudes relate to teaching, student management and team-playing, all of which are enhanced through experience. On the other hand, didactic competencies require training beyond experience. Didactic competencies can be categorized under a curriculum development, teaching and evaluation and reflection of education. Another teaching competency area is that of subject matter, which is associated with content-related expertise. Beyond the knowledge of the subject matter, there is need for the teaching staff to develop pedagogical approaches to the specific subject matter [18]. Pedagogical attributes differ from discipline to discipline. In addition to general pedagogical attributes that all teaching staff

should be exposed to, there is need for the latter to be exposed to pedagogical attributes specific to their subject matter.

The various academic departments of the universities should expose their teaching staff to specific subject matter-related pedagogical attributes. This view is further supported by that of Materu [19] who pointed out that there was need for universities to adjust their program structures, curriculum and teaching and learning methods in order to meet the new demands of competencies, which include adaptability, team work, communication skills and motivation, more so for continual education. Teaching staff in the university, thus, should be exposed to the competenciesthat enhance teaching, learning and student assessments. The need for specific training on e-learning techniques and requirements, taking cognizance of the paradigm shift in the use of electronic techniques of delivery of both academic programs and courses and the effects of globalization, cannot be downplayed.

2.AIMS

- Creating of awareness for the establishment of the system for didactical training of academic staff in the Republic of Macedonia;

- Initiation of the appropriate changes in the legal framework for partial academic career development based on the acquired competences related to teaching process;

- Offering of a solution for establishment of an institutional didactic incubator as one of the responsibilities of integrated university.

3.DISCUSSION

In the Republic of Macedonia has never been established a system which should provide systematic achieving of experiences and skills related to the teaching process for academic staff. It means that except the graduates from the study programs at the faculties that are teaching base such as: pedagogy, natural sciences, arts, philology, philosophy and physical education, other graduates have never possibility to get formal education or courses in methodic, didactic, pedagogy, psychology, docimology, andragogy etc. Even the acquired knowledge of the mentioned graduates is not enough and it is not a guarantee for realization of successful teaching process as further teaching assistant, lecturer or professor.

Such situation caused a lot of improvisations in this domain resulting in stereotypic teaching process and non-objective assessment and evaluation process. Namely, immediately after the graduation, part of the best students is recruited as collaborators at the universities. And almost overnight they are just passing on the other side of the classroom or laboratories taking the role of trainers and educators. Very often this is very stressful moment for most of them due to the fact that they have never attend a course and they have never learned: how to organize the teaching process, what is the class structure, how to motivate and animate students, how to communicate with them, which kind of methods can be used, how to organize practical training and internship, what are the available teaching materials, how to create criteria for assessment etc. Missing of such (non) formal qualifications and competences among the collaborators and professors create a sense of uncertainty.

From the other side, all over the world the trends in this field are in expansion offering new and contemporary approaches in teaching process in academic institutions increasing the quality in their educational services. International experiences show that some of the coun-

tries have formalized this type of methodic-didactic training of academic stuff and it is a precondition for their career development. It is the case in Sweden, where during the habilitation process of teaching stuff, they have to expose an appropriate number of credits from those domains. In Russia it is organized in a way that all teaching stuff from one university have a didactic dossier which need to be temporary updated in order to fulfill criteria for higher position at the university. There are lots of examples from the countries with the rich academic tradition where those services are delegated to appropriate accredited training providers.

Having in mind these facts, with the mission to improve the quality of tertiary education services, we start to set up a system for teacher training of academic stuff. One of the integrative functions of the Mother Theresa University is organization and maintenance of this system. It is composed by two parts: I) Temporary events organized by the professionals dealing with teaching methodology; II) Permanent consultancy for the matters related to the teaching process. Target groups of this system are all professors and collaborators aiming to get appropriate number of didactic credits. During the realization of the workshops and seminars there will be organized theoretical lectures, discussions, preparation of seminar works, demonstration and simulation of theoretical teaching and practical exercises, watching and analyzing of teaching movies and appropriate software etc.

For such purposes in the frame of Mother Teresa University was established Center for Educational Policies and Training (CEPT) where we already started with the concrete activities organizing seminar for modern trends in academic teaching and workshop for preparation of study programs and syllabuses in cooperation with prominent international partners. We are aware that CEPT is not a magic tool which will immediately solve the problems related to quality assurance in our university, but for sure it can contribute in providing better education services. There are still opened issues related to legal status of CEPT, sustainable financial support, appropriate human resources which need to be solved as soon as possible in order to avoid any improvisation and its devaluation.

4. CONCLUSIONS

University policies need to include aspects that are geared towards teaching effectiveness including the enhancement of didactic competencies among teaching staff of the universities. More specifically, the policies on didactic competencies should enhance the plan-do-check cycle of competencies, namely, curriculum development, including course and module development; pedagogical attributes; and quality assurance competencies.

Institutions offering university education need to establish internal quality assurance structures to monitor andenhance quality in their institutions while developing a quality culture. The European efforts towards quality assurancecalled for qualified and competent teaching staff in order that the quality of education would be enhanced andcomparable.

Moreover, the 21st century pedagogical shift requires of teaching staff to be re-trained in order to be able to effectively address the current needs of university education. Teaching staff, therefore, need to be sensitized on the need for enhanced didactic competencies, which are not only influences by practice but greatly by training.

Universities managementneeds to consider introducing comprehensive training programs on

didactic competencies for the teaching staff of the university. In addition, consideration should be given to modifying the job recruitment and advancement requirements to include aspects of didactic competencies. Training on didactic competencies should also be considered as part of the universities' teaching staff induction programs.

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EURO-ATLANTIC INTEGRATIONAND ECONOMIC PERSPECTIVES FOR MACEDONIA

FATMIR BESIMI
Faculty of Business and Economics, South East European University, North Macedonia
f.besimi@seeu.edu.mk

ABSTRACT

Macedonia's aspiration to join NATO and EU represents countries strategic interest to ensure sustainable peace and shared prosperity. This analysis focuses on economic benefits of Euro-Atlantic integration, structural reforms and economic convergence. Following the experience of the New Members States to NATO and EU from Central and Eastern Europe there has been several economic benefits, such as faster economic GDP growth, reduced unemployment, higher investments (domestic and foreign), increased credit activity, higher productivity growth and other economic and business opportunities from joining larger market. In addition, the role of structural reforms is considered in the analysis to show the impact on economic growth and convergence. However, there is an empirical evidence for the endogenity of the integration process, meaning that countries are better of on structural reforms after they become member of the Euro-Atlantic community. Conclusion that may be drawn from this analysis is that joining the EU and NATO will help speeding up the economic growth and convergence and also enhancing structural reforms which further will support faster catching-up with the EU living standard.

Keywords:Economic convergence, Euro-Atlantic integration, EU, NATO, Structural reforms

INTRODUCTION

Since the independence of Macedonia, the economy has showed a moderate growth with a transformation to an open market economy towards Euro-Atlantic integration. After a decade of stagnation on it's the integration process is still on track after signing the agreements with Greece and Bulgaria on the name issue and good neighborhood, respectively. Macedonia got an invitation for joining NATO and a conclusion from European Council to consider opening negotiations on June 2019 after presenting the progress report. The political process is characterized with the referendum on the name issue and agreement with Greece, while the positive outcome will mean further progress with the integration, namely, NATO membership and opening negotiations with the EU as far as the respective amendments to the Constitution will be adopted in the Parliament.

The main questions that remains is: Will we be better after Macedonia joins NATO and the EU and what kind of perspective will we have? So far, we have gone a long way with many challenges, and with right and courageous decisions we are here completely deserving. However, this is not a moment of relaxation; on the contrary, it is necessary to go through the hard part and finish the painstaking work of the reforms.

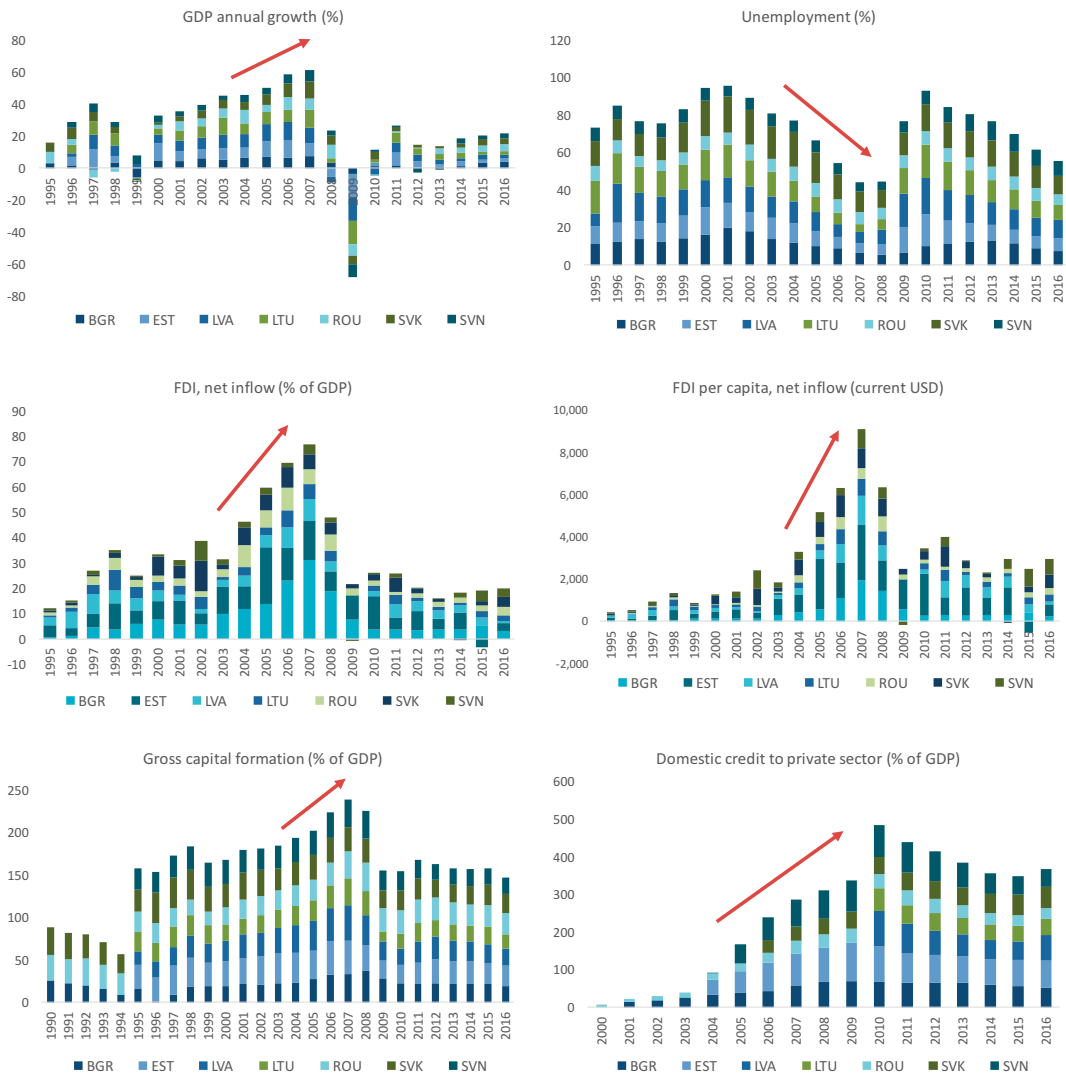
With NATO and EU membership there will be

more benefits for the citizens: it will cement the future strategic determination - united and equal, to be on the same decision-making table with the developed democracies and economies of the West. To make it clear, it is enough to look at the experiences of those who have went down this road, that is, the countries of Central and Eastern Europe, and some of them were so far back behind us at the beginning of the transition in the 1990s. Now they are part of the European Union and NATO. It's a good lesson.

NATO AND THE EU

Central and Eastern European countries that became NATO members in 1999, then members of the EU with the big wave of EU enlargement in 2004, after which Albania and Croatia joined in 2009 (the train that Macedonia missed), and then in 2013 Croatia joined the EU, and last year Montenegro became the 29th NATO member state. From their experiences we will know best what we can expect. There is a positive experience, which gives us optimism about our future on the road we are on as presented in Figure 1 for countries from Central and Eastern Europe that joined

VCFigure 1. Economic impacts of EU and NATO membership



Source: Author's calculation from World Bank Data

ECONOMIC BENEFITS FROM JOINING

NATO and EU in 2004, while Bulgaria and Romania joined EU in 2007.

Looking at the experiences of these countries, a lot of positive things can be listed, based on Eurostat and the World Bank data on economic movements (also see World Bank 2017,World Bank 2018 and IMF 2015a). However,there are many challenges ahead to achieve these results. Yes, that's right, but these ten facts, or related steps that lead from one to another from the first to the tenth, are firm arguments about the benefits that our citizens will feel from the integration into NATO and the EU.

First, NATO and EU membership means strengthening the geo-strategic positions of the Republic of Macedonia. As an equal member of NATO and the EU, we will be able to decide on important global and geo-strategic issues that we otherwise have no opportunity to influence if we are not a member. By joining NATO and the EU, on the principle of "equal among equals" and the principle of solidarity, we will have the opportunity to influence and the equal right to make decisions in these organizations.

Second, membership in NATO increases the country's security and stability, thus creating a better basis for economic growth and development. Economic growth depends largely on the country's ability to secure sustainable peace and stability, i.e. long-term security and political stability.

Third, NATO and EU membership will contribute to greater democratization and better governance. Member States have shown greater progress regarding the credibility of institutions, the effectiveness of the government, the rule of law, freedom of speech and the control of corruption. The dynamics of reforms are accelerating with NATO and EU membership.

Fourth, EU membership means entering one of the largest and most developed markets on a global scale, which increases the prospects for economic growth. It is a market of 500 million inhabitants or 7.5 percent of the world's population, that is, the world's largest economy with a share of 23.8 percent of the world's GDP, followed by the United States with 22.2 percent and China by 13.4 percent in 2014 year. Accordingly, EU integration for Macedonia will mean entering a market 25 times larger, with a significantly lower unemployment rate and a higher living standard.

Fifth, NATO and EU membership contributes to a better business climate and a better credit rating for Macedonia. That is, member-states show faster progress in structural reforms to improve the business climate and private sector development. Stability along with predictability of policies also affects the country's credit rating and the increase in investment.

Sixth, NATO and EU membership leads to an increase in total investment in the country. The security, stability and favorable business climate are encouraged by domestic and foreign investors, which are supported by increased lending activity of the banking sector. For example, foreign direct investment in Estonia, Latvia and Bulgaria have increased threefold in the first three years after membership in NATO and the EU, similar to Albania in the its first year of NATO membership, when foreign direct investment doubled.

Seventh, NATO and EU membership is followed by a trend of opening new jobs and reducing unemployment. New investments create new jobs, which are followed by investments in new knowledge and technology (know-how), as well as education reforms will contribute to increasing the competitiveness of the domestic economy.

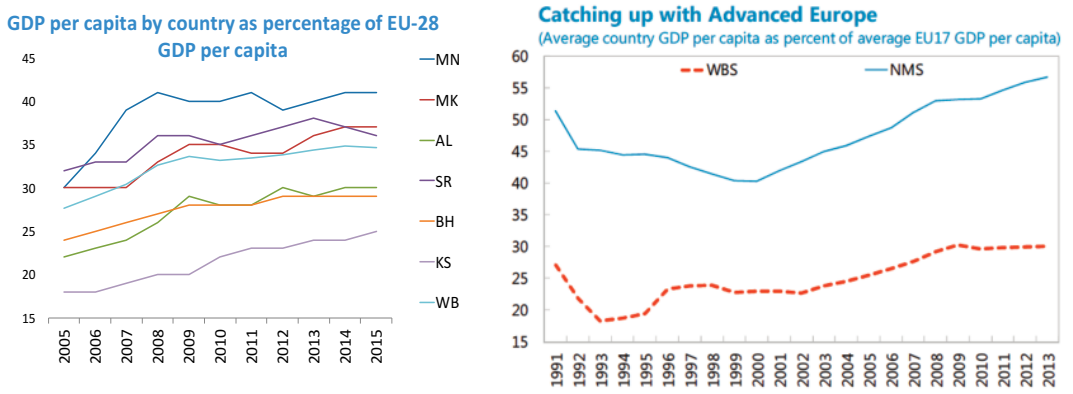
Statistics confirm this with an accelerated downward trend in reduced unemployment after EU and NATO membership.

Eighth, EU membership means an incentive to increase competitiveness and exports. New member-states have accelerated growth in labor productivity. Increased competitiveness will mean an increase in exports and trade and faster economic growth. Thus, the economy will be ready for competition in the big European market, which at the same time represents Macedonia's largest trading partner.

Ninth, EU and NATO membership contributes to accelerating economic growth. The new member states are seeing more economic growth and are closer to the EU-28 living standard. That is, new members are growing faster than the Western Balkan countries. As an example, Latvia and Macedonia were at the same level of 20 percent of GDP per capita in relation to the EU-11 average in 1995, while in 2015 Latvia reached 50 percent, and Macedonia up to 25 percent. More specifically, at the time of Latvia's accession to NATO in 2004, GDP growth in this country amounted to 8.3 percent, and it grew subsequently to 10.6 percent and 11.8 percent in the following years.

Tenth, and final, EU and NATO membership means a higher standard of living and a better quality of life for citizens. For this it is enough if we compare the experiences of the Western Balkan countries with the countries that have become EU members in the last two decades. If we compare GDP per capita relative to the EU-28 average, we will see that the Western Balkans, with one-third of the EU's average GDP, are behind the new members at two thirds of the EU average and showing an advantage and in other indicators of quality of life, such as the quality of education, health and other social infrastructure.

Figure 2. Economic convergenceview through GDP per capita



Source: Eurostat (left graph) & IMF (right graph)

And finally, this time we are not alone. With the membership in NATO and the EU, the financial assistance from abroad and from the European (structural funds) and international financial institutions will be increased. However, despite all the support that can be expected from outside, the solution is among us, our obligations remain for us, and we need to make those changes, and the winners will eventually be us, that is, our citizens!

ECONOMIC CONVERGENCE AND STRUCTURAL REFORMS

The raise of Brussels' and other EU capitals' attention on the Western Balkans is a good signal for the EU enlargement process enriched with

new initiatives as the Western Balkans Six, Connectivity Agenda, Berlin Process, Brdo-Brijuni Process, Berlin Plus and others. In the last years, the long-standing process of EU enlargement for the Western Balkans and the raised euro skepticism within EU member and populism in the candidate countries states affected the credibility of this process which requires strong support from the EU and serious commitments from candidate countries to get back on faster track the Western Balkans on EU integration.

The EU integration has been an important process of economic, political and social transformation of the Western Balkans and its convergence with the European Union. In the last 25 years the evidence of the Western Balkans (Albania; Bosnia and Herzegovina; Macedonia; Montenegro; and Serbia) and the New Member States (Bulgaria; Croatia; Czech Republic; Estonia; Hungary; Latvia; Lithuania; Poland; Romania; Slovak Republic; and Slovenia) shows that there has been a convergence with the EU average level of the living standard during the transition period of the 1990s and later through the EU integration process. However, there is still a gap compared to the EU living standard and the economies of the Western Balkans need to grow faster in order to catch-up the EU level. Also, in the recent years the convergence has slowdown, while after the economic crisis catching-up is slower in the Western Balkan compared to the New Member States (Figure 2).

The challenge is how to accelerate the EU integration process and economic convergence of the Western Balkans with the European Union. This assumes structural reforms to enhance competitiveness of their economies. However, as stated by IMF (2015b) "the process of structural transformation began to stall in the mid-2000s, in the face of vested interests and as reform fatigue set in, and remains incomplete." In addition, as the EU enlargement process is taking longer, Stanfey et al. (2016) argues that "...long-term challenges remain, such as the possibility of a slowdown in reforms...". Analyzing across the Copenhagen convergence criteria, the evidence from the Western Balkans shows that countries from the region have shown slower progress in fulfillment of political criteria compared to the economic criteria and the approximation with the European 'Acquis' (Besimi, 2016).

Next, the focus is to investigate the relationship between the structural reforms and economic convergence. Initially, we look at comparative statistics about the relationship of Copenhagen convergence criteriaand GDP per capita of the country as a share of EU-28 average through a scatter diagram and simple linear regression analysis that show positive relationship in all three criteria: political, economic and acquis (Besimi, 2017).

There is a growing literature on the impact of structural factors on convergence, though mostly on larger panels of countries. IMF (2015b) found positive relationship of structural reforms with productivity and convergence, while in the following literature review (Acemoglu et al., 2005; Aghion et al., 2005; Campos and Coricelli 2002; Che and Spilimbergo 2012; Ciccone and Papaioannou 2009; Dabla-Norris et al. 2016; IMF 2015a; and Fung 2009) they summarize that reform priorities for sustaining convergence have been found to vary with income levels. The results indicate that the productivity dividends depend on where a country is in the development process, highlighting the need for calibrating reforms to the stage of economic development. As economies and the

financial structures develop and become more sophisticated, reform payoffs and priorities shift. Looking over longer horizons, our empirical analysis finds that the productivity payoffs vary across reforms and over time. The results also suggest that the benefits of reform tend to become more pronounced when reforms are bundled together. Moreover, the experiences from different countries hint at potential lessons for effective reforms, including the importance of strong ownership, the ability to sustain reforms, and the need for complementary macroeconomic and structural policies. Namely, policy reforms may have nonlinear effects that can be contingent on the quality of political and economic institutions.

Open issues in the literature related to the EU enlargement of the Western Balkans remain catching-up with the EU living standard and deepening the structural reforms. Namely, Sanfey et al. (2016) states that "The key issue is whether the Western Balkans countries can narrow the gap in the coming decade and, if so, what do they need to do to achieve this." Similar, conclusion is made by IMF (2015b) "What, then, needs to be done? Preserving macroeconomic stability is paramount for durable growth... Embarking a new

Figure 3. Structural reforms progress in WB and NMS

Source: Author's calculation from World Banka (WGI), World Economic Forum (GCI) and EBRD (TI)

on deep structural reform is a key policy priority for the region." It is also stated clearly by European Commission (2015) in 'EU Enlargement Strategy': "Enlargement needs to be understood as a process which supports reform and the fundamental changes needed to meet the obligations of EU membership... Enlargement can only be of benefit to the EU and to partner countries if there is genuine, sustainable reform. Through this process countries will become fully ready to join the EU and be able to reap the benefits and assume the obligations that arise from membership."

Following the above empirical investigations and in our research (Besimi and Monastiriotis, 2018), we continue with regression analysis of the impact of structural reforms on convergence for the Western Balkans and New Member States for the period 1996-2014. To investigate that impact we examined 25 panel data regressions as the high correlation in the reform indices requires them to enter the regressions one at a time. Thus the regressions will not account for reform complementarities. In order to cover more aspects of reforms, we examined three sets of regressions about the impact of reforms on convergence: world governance indicators (voice and accountability, political stability, regulatory quality, governance effectiveness, rule of law, control of corruption); transition indicators (large scale privatization, small scale privatization, governance and enterprise restructuring, price liberalization, trade and forex system, competition policy); and global competitiveness index (institutions, infrastructure, macroeconomic environment, health and primary education, higher education and training, goods market efficiency, market size, labor market efficiency, financial market development, technology readiness, market size, business sophistication). Also, of research interest was to examine the impact of the EU membership on convergence in order to check about the endogeneity of the integration process. Since, we consider dynamic panel data we also introduce lags of the dependent variable for better specification of the model.The results of the empirical analysis suggest the following three finding: Convergence is persistent and stable long-term process; Structural reforms have positive impact on convergence; and EU membership enhances convergence. Convergence is persistent process with significant impact of lags from the first three years. It is a stabile process in cumulative with two-year lags, although the first lag has a coefficient larger than 1, the second lag is negative impact thus stabilizing the cumulative impact. Structural reforms' impact on convergence is positive and statistically significant in most of the reform indicators. The impact of reforms on convergence becomes significant when introducing more lags of the convergence to control for autocorrelation effect. The positive impact of EU membership on convergence, namely after becoming EU members countries perform better with the convergence indicates the endogeneity of EU integration process, which will have also policy implication in addressing the role that EU can play in enhancing structural reforms and EU integration of the Western Balkans.

Since our main interest in this section is the impact of structural reform on economic convergence, we further continue with a descriptive comparison of the structural reforms progress in the Western Balkans and New Member States (Figure 3). We can easily see that structural reforms in New Member States advancing in comparison to the Western Balkans. This difference is higher with World Governance Indicators which assumes to be more complex in terms of their po-

litical impact for local policy makers. Although lower, but there is still difference in other indicators as well, Western Balkan countries lack behind New Member States also with respect to Global Competitiveness Indicators and Transition Indicators.

Following the above empirical analysis, we may conclude with the following two policy remarks:First, structural reforms have positive impact on convergence as a long-term process, while the impact varies across reforms and over time and their impact is also non-linear dependent on the quality of political and economic institutions. Second, the evidence shows that the EU membership has played significant positive impact on convergence for New Member States, which indicates for the endogeneity of EU integration process, thus we may suggest that EU can play a role in enhancing credible structural reforms and further convergence of the Western Balkans with the EU.

THE WAY FORWARD

Macedonia aspires to reach the living standards of the European Union (EU) with faster and inclusive growth that imposes a reviewof the current development approach, in order to improve results in terms of GDP growth, poverty reduction and economic sustainability.

The Systematic Country Diagnostic (World Bank, 2018) identifies three mutually reinforcing pathways for Macedonia to sustainably accelerate growth, reduce poverty, and consolidate the middle class. The first is to foster a more dynamic and competitive private sector. The second is to build up human capital to be more competitive and adaptive and close opportunity gaps. And the third is to achieve sustainability through effective governance, fiscal prudence, and enhanced environmental management for resilience to natural hazards. Embarking on these strategic pathways would both mitigate hard-won gains but also help sustain the robust and inclusive growth necessary to eliminate extreme poverty - a goal Macedonia can achieve within the next decade -and promote shared prosperity. Strengthening the dynamics and competitiveness of the private sector will be achieved by improving the trade connection, integration in the value chain, favorable business climate, improving the capacities of companies, supporting start-up businesses, improving access to finance and developing new forms of financing. The development of a more competitive and adaptable human capital will be achieved by providing quality education and training in acquiring the necessary skills throughout the life cycle, as well as providing quality preventive and primary care. Ensuring sustainability through effective governance, fiscal prudence and enhanced environmental management will be achieved through the rule of law, credible public sector institutions that are responsible to citizens, fiscal sustainability and an integrated approach to protecting the environment and tackling climate change.

Summarizing, integration into the European market, infrastructure connectivity with the region and macroeconomic stability on the one hand, by increasing investment, human capital and improving competitiveness, on the other hand, will contribute to faster economic growth. This, for a small economy, will mean penetrating new markets, thereby increasing exports and gross domestic product that will contribute to a higher standard of living. In order to achieve this, Macedonia will have to import knowledge (know how) and create a generation of trained and professional labor, young and creative, ambitious

professionals and entrepreneurs with many contacts around the world, in order to make the economy more competitive to cope with developed countries through EU and NATO membership. With consistent economic policies and reforms, this growth would be supported by a national fund for strategic projects following the example of Juncker's Investment plan, or the so-called The Marshall Plan, which in our case, besides state funds, which would attract private sector and international institutions for financing strategic infrastructure projects, innovations and development.

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CONTEMPORARY SUSTAINABLE DESIGN STRATEGIES REGARDING WASTE MANAGEMENT BASED ON THE TRANSCENDENTAL BUILDING PRINCIPLES OF VERNACULAR ARCHITECTURE

RADMILA TOMOVSKA
UNIVERSITY MOTHER TERESA, FACULTY OF ARCHITECTURE AND ENGINEERING), SKOPJE, NORTH MACEDONIA, radmila.tomovska@unt.edu.mk

ABSTRACT: Contemporary sustainable tendencies reinvent ways for reducing waste and lost of materials, which leads to a reduction of environmental pollution. Having this in mind, the objective of this paper is to reveal and promote certain forgotten design strategies of the Balkan's vernacular architecture, which today have become popular from the perspective of waste minimization. More precisely, this research analyses sustainable design strategies that are in correlation with reuse and waste reduction by using the example of traditional Ohrid house as a selected representative of the Balkan vernacular architecture. Furthermore, this research points out at sustainable solutions regarding on-site minimization of construction waste in the example of the traditional Ohrid house during the three phases of the material's and building's life cycle: pre-building, building, and post-building phase.

The study was conducted in the following steps. At first, the basic conceptual framework of sustainable design was analyzed in order to indicate which of the mentioned principles, strategies, and methods can be recognized in the analyzed case. Than, the sustainable qualities, or the so called "green features" of the analyzed building materials of traditional Ohrid house, were established on the basis of previously defined criteria. A comparative analysis of the strategies and methods implemented on the analyzed case with the contemporary sustainable design strategies and methods offered precise results which are elaborated as concluding remarks in this paper.

The applied on-site waste minimization measures and the principle of using materials with low-embodied energy, identified in the example of the traditional Ohrid house, can be understood as conceptual basis for finding more efficient solutions in today's material and energy conservation practices, proving that sustainable architecture could be achieved by a simple and thoughtful application of local materials and building techniques.

KEYWORDS: Reuse, On-site waste minimization, Traditional Ohrid house, Sustainable design strategies, Ohrid's vernacular architecture.

1 INTRODUCTION

In the contemporary sustainable building practice, especially in terms of waste generation and management, the concept of 3R stands out in particular, incorporating the principles: reduce, reuse, and recycle. Since waste generation on-site is directly related to the design process, better site planning and management of the materials is believed to be the solution for on-site waste minimization [1]. When reuse of building materials influences the design process, the circulation of materials and the role of waste products within local and regional boundaries become important considerations for the architecture of particular region. Contemporary architecture should aim at improving the process of waste management. Improving waste management makes better use of resources and helps in waste minimization, as well as encourages less dependence on imports of raw materials and has lower impacts on the envi-

ronment. If waste is to become a resource to be fed back into the economy as a raw material, then much higher priority needs to be given to reuse and incorporation of waste into new building materials [2].

This research aims at identifying those principles of construction and selection of materials applied in the building process of Balkan vernacular architecture, which today are considered as basic strategies of sustainable architecture from the aspect of waste management. More precisely, this research analyses sustainable design strategies that are in correlation with reuse and waste reduction by using the example of traditional Ohrid house as a selected representative of the Balkan vernacular architecture.

The importance of the material history is vast and offers possibilities for critical reading, interpretation and development of the concepts related to the transcendental principles and strategies of design and construction [3]. The conceptual adoption of the design strategies regarding reuse and incorporation of waste into new materials, in order to satisfy today's and future needs, puts emphasis on the importance of the tradition for the contemporary sustainable architecture.

2 BASIC CHARACTERISTICS OF THE TRADITIONAL OHRID HOUSE

The term Ohrid's vernacular architecture refers to the traditional secular architecture of the town of Ohrid represented by the traditional Ohrid house. This house can be characterized as a regional variant of the Ottoman type of urban house with specific indigenous characteristics (Figure 1), which are specifically related to the spatial plan and structural details. The Ohrid region has a Mediterranean - continental climate, which imposed that this house is organized in two parts – a winter and a summer apartment [4]. Two main building materials - stone and wood, were applied in the two constructive systems: massive stone masonry - lower part of the house representing the winter apartment, and a light wooden structure, the so-called bondruk system - upper parts of the house representing the summer apartment [5].

The massive system was constructed of stone walls and is considered as very durable structure. On the other hand, the bondruk wall was constructed of basic timber frames consisting of post and beam structures with trusses or braces supporting at the corner points (Figure 2). This type of timber frames was widely applied, since it allowed the houses to be built quite quickly and the timber material did not have to be of a top quality [6]. One of the peculiarities of the Ohrid house is the bondruk wall itself - 18 cm thick wall. Such wall, which is a combination of two layers of wooden-frame walls and an intermediate air layer, represents a very light, but not very durable construction.

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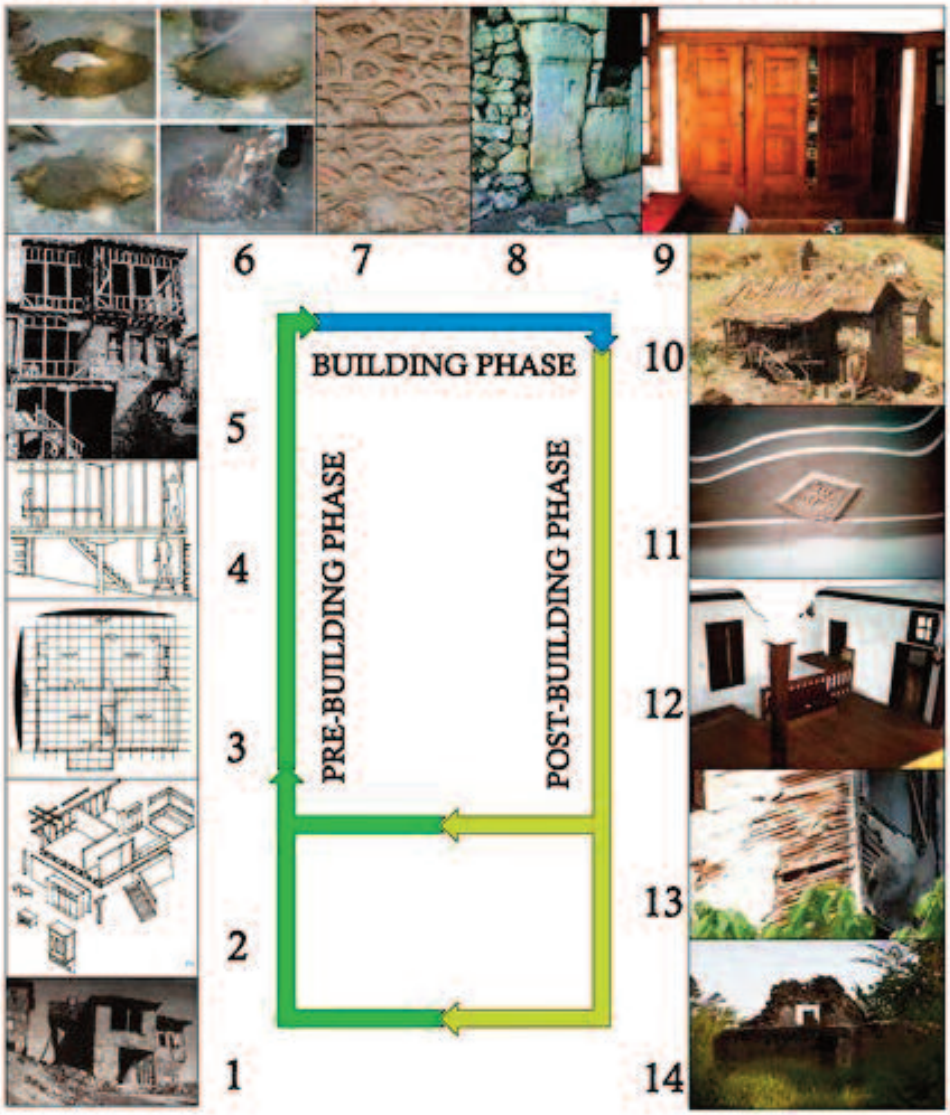
3 RESULTS AND DISCUSSION

3.1 Conceptual framework of sustainable de-

Fig. 1. Traditional ohrid house near church St Sofia (left), House of the Kanevce family (middle), House of the Robev family and part of the house Uranija (right); source: Autor.

LIFE CYCLE DESIGN OF TRADITIONAL OHRID HOUSE



1. Local, natural and non-toxic materials - Buildings stem out of the ground
2. Design for reuse
3. Modular coordination in the proces of design (standardization and type-sorting of elements of construction and finalization
4. Proper sizing of the building systems
5. "Elasticity" - flexibility of the building: Possibility of changing the spatial plan, as well as replacement of the deteriorated material of the bondruk system
6. Incorporation of waste, as well as the scrap material, in production of new usefull building materials, at the construction site
7. Building techniques that enable waste prevention and source reduction
8. Durable materials with low maintenance
9. Wood protection and extending it's durability with natural resources
10. Reuse of existing parts of the building
11. Recycled content feature - Building materials produced partialy from construction waste (the traditional plasters)
12. Reuse of building components and materials
13. Biodegradable building materials
14. After the end of the building's life cycle, building goes back to earth.

Table 1. Conceptual framework of sustainable design

Principle:	**Economy of Resources**		
Strategies:	**Energy Conservation**	**Water Conservation**	**Material Conservation**
Methods:	energy conscious urban planning	reuse of water on site	***material conserving design and construction***
	energy conscious site planning	collection of rainwater and grey water	***proper sizing of the building systems***
	passive cooling	reduction of consumption and waste	***rehabilitation of existing structures***
	insulation		***use of reclaimed of recycled materials and components***
	alternative sources of energy		use of non-conventional products as building materials
	building and window design that utilizes natural light		
	energy efficient equipment		
	materials with low embodied energy (natural, local and biodegradable materials)		
Principle:	**Life Cycle Design**		
Strategies:	**Pre-Building Phase**	**Building Phase**	**Post-Building Phase**
Methods:	***source reduction by design***	***minimization of site impact***	***adjustment of existing structures to new users and programs***
	minimization of energy needed for distribution of materials	recycling of construction materials and provision of waste separation facilities	***reuse of building components and materials***
	use of materials made from renewable resources	***incorporation of scrap and useful materials found on the site***	***reuse of existing parts of the building***
	use of harvested materials or materials extracted without causing ecological damage	***use of building techniques that support energy and material conservation***	recycling of a building components and materials
	use of recycled materials	***use of non-toxic materials and cleaners***	***reuse of the land and the existing infrastructure***
	use of durable materials with low maintenance		
Principle:	**Humane Design**		
Strategies:	**Preservation of Natural Conditions**	**Urban Design and Site Planning**	**Design for Human Comfort**
Methods:	respect of topographical contours	integration of design with public transport	provision of thermal, visual and acoustic comfort
	non-disturbance of natural hydraulic process	promotion of mixed use development	provision of visual connection with exterior
	preservation of existing flora and fauna	avoidance of pollution contribution	operable windows and fresh clean air
			use of non-toxic and non out gassing materials
			accommodation of persons with different physical abilities

sign in the example of Ohrid houseThe goal of sustainable design in general is to find architectural solutions that enable the well-being and coexistence of organic and inorganic groups [7]. In order to meet this goal, a building must integrate the following three principles: Economy of Resources, Life Cycle Design, and Humane Design — in the design, construction, operation and maintenance, and recycling and reuse of architectural resources [8]. These principles are the basis of the conceptual framework of sustainable design, each of them embodying a unique set of strategies, shown in Table 1.

For better understanding, all the sustainable methods implemented in the example of the traditional Ohrid house are presented in Table 1 in grey colored cells. Ones that are not implemented are in white color. This research deals only with those sustainable strategies and methods that have been applied in the example of the traditional Ohrid house and are in correlation with reuse and waste reduction. They are additionally marked in italics as bold, for better visibility.

3.2 Sustainable features of building materials of traditional Ohrid house

Three groups of criteria are identified in this research on the basis of material's life cycle. The selection criteria include sustainability with regards to a wide range of environmental issues: raw material extraction and harvesting, manufacturing processes, construction techniques, and disposal of construction waste. These criteria are used in further analyses to determine the "green" features of the building materials used for construction of the traditional Ohrid house (Table 2). "Green" feature of building material represents a sustainable quality of a particular material that was designed, manufactured, and applied with environmental considerations [8], especially regarding waste management.

Table 2 represents sustainable "green features" of the analyzed building materials, grouped according to the affected building life-cycle phase. The presence of a "green feature" is marked by a "plus". The presence of one or more of these "green features" in a building material can assist in determining its relative sustainability. From Table 2 one can conclude that almost all of the analyzed building materials, except glass, indicate the presence of a number of "green features" which characterizes them as sustainable building materials.

The organic material basis of the house, as well as its characteristics of biodegradability, reveal a natural cycle of these buildings. The use of local, natural, non-toxic, and biodegradable materials enables a comfort in the quality of life during the whole lifecycle of the building. In many cases materials were obtained locally, even at the building site itself. Natural materials used in the example of the Ohrid house are lower in embodied energy and toxicity, in comparison with man-made materials. They required less processing and are less damaging to the environment. Their biodegradable feature enables saving energy in the process of disposing of the construction waste in the post-building phase.

Application of durable materials with low maintenance requirements represent another sustainable feature detected in the example of the Ohrid house. The ground floor of Ohrid house is built from treated and untreated blocks of stone, which

Table 2. Sustainable "Green" Features of Building Materials of Ohrid Traditional House

Material's life cycle phase	Criteria	stone	wood	clay tiles	earth (mud)	čok plaster	interior plaster	glass
Pre-building phase: Manufacture	waste reduction	+	+		+	+	+	
	pollution prevention	+	+	+	+	+	+	
	recycled content					+	+	
	embodied energy reduction	+	+	+	+	+	+	
	use of natural or naturally based materials	+	+	+	+	+	+	+
Building phase: Use	reduction in construction waste	+	+	+	+	+	+	
	use of local materials	+	+	+	+	+	+	
	energy efficiency	+	+					
	use of non-toxic materials	+	+	+	+	+	+	+
	durability	+		+				+
Post-building phase: Disposal	reusability	+	+	+				
	recyclability - hypothetically		+	+	+			+
	biodegradability		+	+	+	+	+	

is a material that is well-known for its durability. The applied treated stone was usually in form of a stone capital, part of tombstone, etc. It originated from the 6th till 9th century and in 18th or 19th century was incorporated into the massive walls of Ohrid houses. Unlike the stone, wood cannot be characterized as durable material. However, in the example of Ohrid traditional house beech wood from the immediate surroundings, which is hard and durable, was the most commonly used wood type. A significant ecological feature observed in the Ohrid house is the way the wood is protected and its life extended. Wood protection consisted of natural resources, such as: vinegar, oil, wax and tar [4]. They are non-toxic, eco-friendly products, while today, most commonly used materials for wood protection are chemical coatings that are often toxic and significantly more expensive than the natural materials.

From today's point of view, the materials implemented in the traditional Ohrid house (such as wood, clay tiles, and glass) can be easily dismantled, sorted into common groups of materials, and recycled. Some of the materials used in the construction of Ohrid house possess the so called recycled content feature of a building material. In the analysed case, the traditional plasters applied to the interior and exterior surfaces of the bondruk wall of Ohrid houses can be characterized as materials produced partially from construction waste.

3.3 Conclusion

This research has shown that the implemented sustainable design strategies and methods that are in correlation with the reuse and waste reduction in the example of the traditional Ohrid house are being recognized especially in the domain of the first two principles of sustainable design: Economy of resources and Life cycle design. The sustainable design methods regarding reuse and waste reduction applied to the example of Ohrid vernacular architecture, that are in correlation with the contemporary methods defined by the conceptual framework of sustainable design (Table 1), are the following:

1. Energy conscious site planning;
2. Use of materials with low embodied energy (natural, local, and biodegradable materials);
3. Rehabilitation of existing structures - Adjustment of existing structures to new users and programs;
4. Source reduction by design / Material conserving design and construction:
   - Design for reuse,
   - Proper sizing of the building system,
   - "Elasticity" of the building,
   - Standardization and type sorting of the elements of construction;
5. Use of materials made from renewable resources;
6. Use of harvested m. or materials extracted without causing ecological damage;
7. Reuse of the building components and materials;
8. Reuse of the land and the existing infrastructure;
9. Reuse of the existing parts of the building;
10. Minimizing the energy needed to distribute materials;
11. Use of durable materials with low maintenance;
12. incorporation of scrap and useful material found on the site;
13. Use of building techniques that support energy and material conservation;
14. Use of non-toxic materials and cleaners to protect construction workers as well as end user.

The applied sustainable design methods in the example of the Ohrid house are an integral part of the strategies that imply an energy conservation and material conservation during a pre-building, building and post building phase. Saving energy and resources were the primary goals of the master-builder of the traditional Ohrid house. The economy and rationality, as important virtues of the master builder, contributed in a large extent for inventing smart solutions with regards to on-site waste minimization. Even in the pre -building phase, i.e. in the process of design and the organic perception of architecture, the basic, conceptual, foundations of the modern sustainable architectural design could be traced. The use of standard dimensions and the modular coordination in the design process allowed reusability of the elements of construction and finalization. Implementing this sustainable strategy, the so-called Design for reuse reveals the relevance of the concept of this vernacular architecture, for the contemporary sustainable practice. The flexible design and organic material basis of the house, as well as its characteristics of biodegradability, reveal a natural cycle of these buildings. The use of local, natural, non-toxic,

and biodegradable materials enables a comfort in the quality of life during the whole lifecycle of the building. It also enables saving energy in the process of disposing of the construction waste in the post-building phase.

Other important sustainable strategy seen in the example of this architecture is saving the material and resources by incorporating the waste produced at the building site in the new, useful construction material. Furthermore, using smart techniques for the construction of the massive wall is another sustainable method which allows saving material and energy in the processing of the stone material. At the same time this specific method provided a unique appearance of the massive wall which influenced the whole aesthetic expression of the Ohrid house.

The applied on-site waste minimization measures, as well as the measures regarding reuse of building materials in the example of the traditional Ohrid house, can serve as conceptual basis for finding more efficient solutions in today's material and energy conservation practices. From today's perspective, if the produced waste from the process of preparation and installation of certain materials (wooden shavings, powder dust from damaged ceramic tiles, bricks, broken glass, etc.) is further used in the plaster or concrete mixture, the financial item related to the transport and relocation of waste would decrease, while the specific characteristics of the material would improve.

From the presented analyses and conclusions one can assume that the sustainable architecture is not just the application of the latest technological advances to reduce negative impact of buildings on the environment, but it is also achieved by a simple application of local materials and building techniques. Also, it can be concluded that good site planning, smart management of the building materials, and environmentally conscious design is believed to be the solution for on-site waste minimization.

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BIG DATA ANALYSES OF ANALYTICS PERSPECTIVES OF IMPLEMENTATION IN THE HEALTH SYSTEM IN MACEDONIA

BEKIM FETAJI
UNIVERSITY MOTHER TERESA, INFORMATICS, NORTH MACEDONIA, bekim.fetaji@unt.edu.mk

LINDITA LOKU
UNIVERSITY GOCE DELCEV, COMPUTER SCIENCES, NORTH MACEDONIA, lindita.loku@ugd.edu.mk

MAJLINDA FETAJI
SOUTH EAST EUROPEAN UNIVERSITY, COMPUTER SCIENCE, NORTH MACEDONIA, m.fetaji@seeu.edu.mk

MIRLINDA EBIBI
UNIVERSITY MOTHER TERESA, INFORMATICS, NORTH MACEDONIA, mirlinda.ebibi@unt.edu.mk

SAMET KERA
UNIVERSITY MOTHER TERESA, INFORMATICS, NORTH MACEDONIA, samet.kera@unt.edu.mk

ABSTRACT: The focus of the research study is to investigate and analyses the current big data issues in order to make sense of big data and use it to improve health. Within the investigation of published literature, based on the realized review concluded that bioinformatics is the primary field in which big data analytics are currently is being applied, largely due to the massive volume and complexity of bioinformatics data. The lack of a formal definition for Big Data has led research to evolve into multiple and inconsistent paths. Furthermore, the existing ambiguity among researchers and practitioners undermines an efficient development of the subject especially its potential to be used in medicine within the bioinformatics discipline. The current main challenge is to efficiently translate science into modern medicine that is limited by our capacity to process and understand these big data. So, there is an urgent need to develop and integrate new , mathematical, visualization, and computational models with the ability to analyze Big Data in order to retrieve useful information to aid clinicians in accurately diagnosing and treating patients to improve patient outcomes. Scientists and health-care providers may learn from one another when it comes to understanding the value of Big Data and analytics. Data, derived by patients and consumers, also requires analytics to become actionable. Insights and recommendations are provided, argumented and discussed.

KEYWORDS: big data, bioinformatics, machine learning, computational model

INTRODUCTION

Data science has been a term in the informatics fieldthat mean that blend of statistics and methodology that specifically pertained to data analysis. However, it was not until the much more recent emergence of Big Data and its role in organizational development and direction, that data science began to be a fundamental requirement of any organization working out how to analyze such massive amounts of data.

Data science is interdisciplinary, incorporating elements of statistics, data mining, and predictive analysis, and focusing on processes and systems that extract knowledge and insights from data. It is also known as “analytics transformation” because the goal is to “transform” raw data into usable insights. It has also been called “industrial analytics” because the context is industrial rather than scientific – to analyze data for competitive or quality improvements that can be gained by having a better understanding of one’s customers, potential customers, service model, and almost any aspect of the organization that can be represented in bytes.

Data scientists [8] use these principles in algorithms, which can be defined as sets of process

rules for a computer to follow, to analyze massive amounts of data. Algorithms can be developed from statistical models, which are helpful for interpreting graphical models where there are multiple unknowns and some special dependency or relationship exists between the unknowns – such as matching up your set of customers with your taxonomy of customer classifications. Some very affecting algorithms largely depend on unsupervised machine-learning so they can refine their effectiveness as they are used, despite the depth of the data and the number of unknowns.

One of the hottest questions in Information Management now is how to deal with Big Data in all its applications: how to gather, store, secure, and – possibly most importantly – interpret what we collect [6]. Organizations that are able to apply effective data analysis to massive amounts of data gain significant competitive advantages in their industries.

According to [4], the organizations no longer question the value of gathering and storing such data but are far more heavily focused on methods to make sense of that all the valuable information that data represents. Although security and storage remain critical issues for IT departments, organizations are finding that their commitment to Big Data can't stop there – they must be able to make sense of their data, to know what data is valid, relevant, and usable, as well as how to use it.

2. LITERATURE REVIEW

The sources of such huge quantity of information we today refer to as Big Data are usually data streams gathered from click streams, transaction histories, sensors, scans and elsewhere. However, the first problem for the correct definition of "Big Data" is the name itself , according to [9], as we might think that it is just related to the data Volume.

Currently identified are the volume of data, velocity and variety and all these facts are known as the 3V's of Big Data (Figure below), which lead to the definition given by Steve Todd at Berkeley University.

According to [6] Big Data is about the insight that we want to extract from information, and there are many well-known applications that are based on Cloud Computing such as email servers (Gmail), social media (Twitter), or storage sharing and backup (Dropbox). All this software manage high volumes of data, where fast responses are essential, and with information coming at a high rate in a semistructured or unstructured way. They must also face the veracity in the information; however, they are not intrinsically considered Big Data.

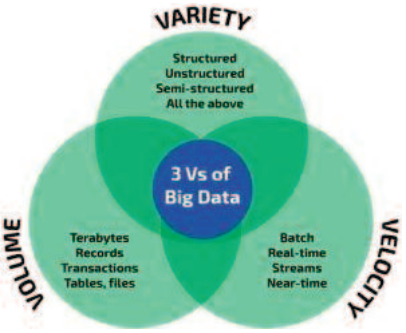

Figure 1. The 3 Vs of Big Data - by Steve Todd at Berkeley University

Data preprocessing is a crucial research topic in Data Mining (DM) since most real-world databases are highly influenced by negative elements such as the presence of noise, missing values, inconsistent and superfluous data, [2].

According to [12], the reduction of data is also an essential task especially when dealing with large data sets, focusing on the selection or extraction of the most informative features or instances in the data.. During the last few decades, the dimensionality of datasets employed in DM tasks has significantly increased. This presents an unprecedented challenge for researchers in these areas, since the existing algorithms not always respond in an adequate time when dealing with this new extremely high dimensions (both in number of features and instances). Exceptional technologies, paradigms and algorithms are thus needed to efficiently process these large quantities of data to obtain information, within tolerable elapsed times.

In the classification problem field, the scenario of imbalanced datasets appears frequently. The main property of this type of classification problem is that the examples of one class significantly outnumber the examples of the other one [5].

Since most of the standard learning algorithms consider a balanced training set, this may generate suboptimal classification models, i.e. a good coverage of the majority examples, whereas the minority ones are misclassified frequently. Therefore, those algorithms, which obtain a good behavior in the framework of standard classification, do not necessarily achieve the best performance for imbalanced datasets , according to [1]. There are several reasons behind this behavior:

- The use of global performance measures for guiding the learning process, such as the standard accuracy rate, may provide an advantage to the majority class.
- Classification rules that predict the positive class are often highly specialized and thus their coverage is very low, hence they are discarded in favor of more general rules, i.e. those that predict the negative class.
- Very small clusters of minority class examples can be identified as noise, and therefore they could be wrongly discarded by the classifier. On the contrary, few real noisy examples can degrade the identification of the minority class, since it has fewer examples to train with.

A large number of approaches have been proposed to deal with the class imbalance problem according to [6].

According to [16], these approaches can be categorized into two groups: the internal approaches that create new algorithms or modify existing ones to take the class-imbalance problem into consideration and external approaches that preprocess the data in order to diminish the effect of their class imbalance. Furthermore, cost-sensitive learning solutions incorporating both the data (external) and algorithmic level (internal) approaches assume higher misclassification costs for samples in the minority class and seek to minimize the high cost errors). Ensemble methods are also frequently adapted to imbalanced domains [17], either by modifying the ensemble learning algorithm at the data-level approach to preprocess the data before the learning stage of each classifier.

According to [17] Resampling techniques can be categorized into three groups or families:

1. Undersampling methods, which create a subset of the original dataset by eliminating instances (usually majority class instances).
2. Oversampling methods, which create a superset of the original dataset by replicating some instances or creating new instances from existing ones.
3. Hybrids methods, which combine both sampling approaches from above.

Within these families of methods, the simplest preprocessing techniques are non-heuristic methods such as random undersampling and random oversampling.

According to [17] in order to deal with the mentioned problems, more sophisticated methods have been proposed. Among them, the "Synthetic Minority Oversampling TEchnique" (SMOTE) has become one of the most renowned approaches in this area. In brief, its main idea is to create new minority class examples by interpolating several minority class instances that lie together for oversampling the training set.

With this technique, the positive class is oversampled by taking each minority class sample and introducing synthetic examples along the line segments joining any/all of the k minority class nearest neighbors. Depending upon the amount of over-sampling required, neighbors from the k nearest neighbors are randomly chosen. This process is illustrated in Figure below, where xi is the selected point, xi1 to xi4 are some selected nearest neighbors and r1 to r4 the synthetic data points created by the randomized interpolation.

According to [11] regarding undersampling, most of the proposed approaches are based on data cleaning techniques. Some representative works in this area include the Wilson's edited nearest neighbor (ENN) rule [3], which removes examples that differ from two of its three nearest neighbors, the one-sided selection (OSS), an integration method between the condensed nearest neighbor rule and the neighborhood cleaning

According to [7] given the cost matrix, an example should be classified into the class that has the lowest expected cost, which is known as the minimum expected cost principle. The expected cost $R(i|x)$ of classifying an instance x into class i (by a classifier) can be expressed as:

$$R(i|x)=\sum_j P(j|x)\cdot C(i,j)$$

where $P(j|x)$ is the probability estimation of classifying an instance into class j. That is, the classifier will classify an instance x into positive class if and only if:

$$P(0|x)\cdot C(1,0)+P(1|x)\cdot C(1,1)\leq P(0|x)\cdot C(0,0)+P(1|x)\cdot C(0,1)$$

or, which is equivalent:

$$P(0|x)\cdot(C(1,0)-C(0,0))\leq P(1|x)(C(0,1)-C(1,1)$$

Therefore, any given cost-matrix can be converted to one with $C(0,0) = C(1,1) = 0$. Under this assumption, the classifier will classify an instance x into positive class if and only if:

$$P(0|x)\cdot C(1,0)\leq P(1|x)\cdot C(0,1)$$

As $P(0|x) = 1 - P(1|x)$, we can obtain a threshold p^* for the classifier to classify an instance x into positive if $P(1|x) > p^*$, where

$$p^*=C(1,0)C(1,0)-C(0,1)=FPFP+FN$$

Another possibility is to "rebalance" the original training examples the ratio of:

p(1)FN : p(0)FP

where p(1) and p(0) are the prior probability of the positive and negative examples in the original training set.

In summary, two main general approaches have been proposed to deal with cost-sensitive problems:

1. Direct methods: The main idea of building a direct cost-sensitive learning algorithm is to directly introduce and utilize misclassification costs into the learning algorithms. For example, in the context of decision tree induction, the tree-building strategies are adapted to minimize the misclassification costs.
2. Meta-learning: This methodology implies the integration of a "preprocessing" mechanism for the training data or a "postprocessing" of the output, in such a way that the original learning algorithm is not modified. Cost-sensitive meta-learning can be further classified into two main categories: thresholding and sampling, which are based on the two last expressions presented respectively.
3. The following malfunctions types of algorithms are
4. examples where MapReduce:
5. Iterative Graph Algorithms: PageRank
6. Gradient Descent
7. Expectation Maximization

3.DATA ANALYSES

We have realized a survey regarding electronic data usage and big data opportunities of implementation in the Health System of Macedonia. Respondents were 30 doctors from different cities of Macedonia who filled in the data.

Analyses of electronic data usage given in the figure belowwe can see that there were50% of those who are beginners in the use of electronic data usage is alarming, because all communication nowadays is oriented towards and through computers and Internet technologies. This suggests that there is low level of analyses of the electronic data in use currently and the staff is untrained to deal with this issue.

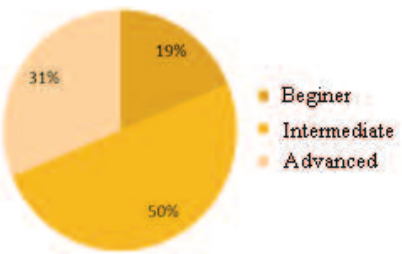

Figure 2. Analyses of electronic data usage

Reports– The respondents commented that in percentage around 91% of data is now entered using software systems and electronic reportingcurrently realizedhowever. This percentage is because there is a software system used from the

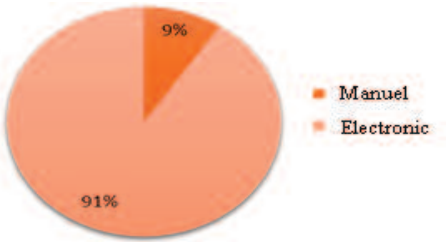

Figure 3. Analyses of Reporting

Ministry of health, but most of reports are not entered within the system like EKG

and other screening data which makes it very difficult to analyze them.

Communication - The tabular overview of this communication appears that the directors of subsidiaries engage in most cases teachers stand out because the result that 44% of the media use that is inconsistent with the level of use of technology by the directors.

Coverage of exploitation technologies for data analyses expressed in numbers and percentages		
Communication technologies	Nr.	%
software	2	6
software& Hard Copy	3	10
software, mail, Hard Copy &	11	34
software, mail &data analyses tool	2	6
software, hard copy, mail & data analyses tool	14	44

Table. 1. Coverage of exploitation technologies for data analyses expressed in numbers and percentages

The outlook for technology - indicators that give positive signs for the use of technology and its integration in health system is the fact that all respondents in question "Will the use of data analyses software help in healthmanagement" responded positively. This gives with the understanding that they are aware of the role that the use of technology to facilitate the performance and management duties. In relation to the degree

of knowledge and experience in their results, that only an opinion declared not a necessity in which you should invest continuously in this direction.

Technology Comments: A large number of surveyed respondents (50%), marked comments about the importance of using data analyses software tools. This provides the opinion that the opportunities to use software for data analyses and big data technologies is percepted as positive from the respondents and that they have positive attitude towards their usage.

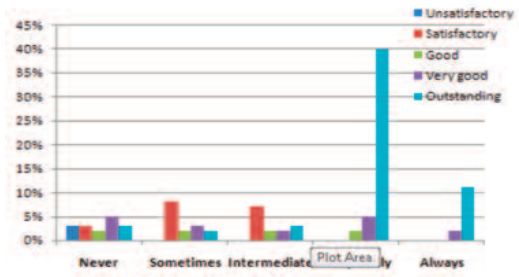

Figure 4. Satisfaction level towards use of ICT vs. previous

4 CONCLUSIONS

The research study aim was to investigate and find out in this review, various examples in which softwaredata analyses and big data technology has played an important role in modern-day health-care revolution, as it has completely changed people's view of health-care activity. The concept of analytics aims to understand data. We set out to portray and discuss perspectives of the evolving use of software for data analyses and Big Data in science and medicine and, to examine some of the opportunities and challenges. According to the survey realized the respondents consider it as very important and it has a large opportunity of usage in the health system in Macedonia. The concept of Big Data and associated analytics are to be taken seriously when approaching the use of vast volumes of both structured and unstructured data in science and health-care. Future exploration of issues surrounding data privacy, confidentiality, and education are needed. A greater focus on data from social media, the quantified self-movement, and the application of analytics to "small data" would also be useful.

Furthermore, in this review, based on the realized review concluded that bioinformatics is the primary field in which big data analytics are currently is being applied, largely due to the massive volume and complexity of bioinformatics data. Big data application in bio-informatics is relatively mature, with sophisticated platforms and tools already in use to help analyze biological data, such as gene sequencing mapping tools. However, in other biomedical research fields, such as clinical informatics, medical imaging informatics, and public health informatics, there is enormous, untapped potential for big data applications. This literature review also showed that: (1) integrating different sources of information enables clinicians to depict a new view of patient care processes that consider a patient's holistic health status, from genome to behavior; (2) the availability of novel mobile health technologies facilitates real-time data gathering with more accuracy; (3) the implementation of distributed platforms enables data archiving and analysis, which will further be developed for decision support; and (4) the inclusion of geographical and environmental information may further increase the ability to interpret gathered data and extract new knowledge.

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STATISTICAL ANALYSIS ON THE ENORMOUS GROWTH OF RESPIRATORY DISEASES FROM AIR POLLUTION IN TETOVO AND GOSTIVAR 2016/17

BESIM MEMEDI
TETOVO UNIVERSITY, FACULTY OF MEDICAL SCIENCES, TETOVO, NORTH MACEDONIA,
besim.memedi@unite.edu.mk

SHPETIM REXHEPI
MOTHER TERESA UNIVERSITY, FACULTY OF TECHNICAL SCIENCES, SKOPJE, NORTH MACEDONIA,
SHPETIM.REXHEPI@UNT.EDU.MK

EGZONA ISENI
MOTHER TERESA UNIVERSITY, FACULTY OF COMPUTER SCIENCES, SKOPJE, NORTH MACEDONIA
egzona.iseni@unt.edu.mk

ABSTRACT: Air pollution continues to be a significant concern to public health worldwide and a tough problem confronted by both developed and developing countries, whose exposure has many substantial adverse effects on human health, especially in respiratory diseases. The purpose of this study is to confirm the eventual large increasement of the respiratory diseases that may occur as the result of polluted air. Also, the analysis of the number of patients affected by respiratory disease and the doubts that it may have on increasing the number of these patients.The data was provided by the Department of Hygiene and Epidemiology at the Tetovo and Gostivar Hospital Hospital . Total number for 2016/17 of patients affected by respiratory diseases.Accurate data analysis and how these patients are presented, each month, and in which season of the year are more pronounced. Our results significantly indicate that from the polluted air, the most affected are the age group of 0 to 6 years of age. Comparison according to both cities, the largest number of patients belongs to the city of Tetovo and that is 65.66%, while in Gostivar the total number for 2016 was 34.34%. However, it is worth noting that Tetovo has more inhabitants.Based on the data from the health institution of the Tetovo and Gostivar Hospital and statistical data processing, we conclude that air pollution has a major impact on the growth of patients affected by the respiratory system.

KEYWORDS: respiratory disease, polluted air, statistical analysis

1 INTRODUCTION

Air pollution continues to be a significant concern to public health worldwide and a tough problem confronted by both developed and developing countries, whose Exposure has many substantial adverse effects on human health, especially in respiratory diseases[1]. The effect of air pollutants on respiratory diseases is well documented.[2,3]

Air pollution occurs when gases, dust particles, fumes (or smoke) or odour are introduced into the atmosphere in a way that makes it harmful to humans, animals and plant.

Air pollutant is a substance in the air that can be adverse to humans and the environment and can be in the form of solid particles, liquid droplets, or gases.

One major outdoor pollutant is soot, the accumulation of atmospheric carbonaceous material-

resulting from the incomplete combustion of organic matter that is associated with high–traffic areas [4]. Previous studies [5,6] focusing on air quality near traffic–concentrated areas investigated the impact of exposure to soot and other major traffic–related pollutants, such as nitrogen dioxide (NO_2), carbon monoxide (CO), particulate matter (PM), and sulfur dioxide (SO_2) on human health, as well as the relationship between traffic density or proximity to main roads, an indicator of degree of traffic–related air pollution and asthma, respiratory illness, and wheeze in people.

The pollutants vary with places, seasons and times. For instance, pollutants in ambient outdoor air and indoor air are not completely the same. The components are not the same at different place even in the same city.

The indoor pollutants are different from that in the ambient air although most of them are the same. Nevertheless, indoor air contains all the same pollutants as in the outdoor air, but the concentrations are different, usually lower. Besides the same pollutants in outdoor air, there are some other components in indoor air which come from inside the building. The major sources include combustion of solid fuels indoors, tobacco smoking, emissions from construction materials and furnishings, and poor ventilation.

The major pollutants in outdoor air are particulate matter (PM), ozone (O_3), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), and Lead (Pb) [1].

Some of air pollutants are elaborated below:

• Sulphur oxides (SOx) - especially sulphur dioxide, a chemical compound with the formula SO_2. SO_2 is produced by volcanoes and in various industrial processes. Since coal and petroleum often contain sulphur compounds, their combustion generates sulfur dioxide. Further oxidation of SO_2, usually in the presence of a catalyst such as NO_2, forms H_2SO_4, and thus acid rain. This is one of the causes for concern over the environmental impact of the use of these fuels as power sources.

• Nitrogen oxides (NOx) - especially nitrogen dioxide are expelled from high temperature combustion, and are also produced naturally during thunderstorms by electric discharge. Can be seen as the brown haze dome above or plume downwind of cities. Nitrogen dioxide is the chemical compound with the formula NO_2. It is one of the several nitrogen oxides. This reddish-brown toxic gas has a characteristic sharp, biting odor. NO_2 is one of the most prominent air pollutants. (NO_2) is mainly emitted from combustion sources but can penetrate into indoor environments. As an irritant of the mucosa membrane of the lungs and respiratory track [7], NO_2 is well known to increase the prevalence of allergic diseases and symptoms, such as bronchitic symptoms, atopic dermatitis, and asthma attacks.

• Carbon monoxide (CO) - is a colourless, odourless, non-irritating but very poisonous gas. It is a product by incomplete combustion of fuel such as natural gas, coal or wood. Vehicular exhaust is a major source of carbon monoxide.

• Volatile organic compounds - VOCs are an important outdoor air pollutant. In this field they are often divided into the separate categories of methane (CH_4) and nonmethane (NMVOCs). Methane is an extremely efficient greenhouse gas which contributes to enhanced global warming. Other hydrocarbon VOCs are also significant greenhouse gases via their role in creating ozone and in prolonging the life of methane in the atmosphere, although the effect varies depending on local air quality. Within the NMVOCs, the aromatic compounds benzene, toluene and xylene are suspected carcinogens and may lead to leukemia through prolonged exposure. 1, 3-butadiene is another dangerous compound which is often associated with industrial uses.

• Particulates, alternatively referred to as particulate matter (PM), atmospheric particulate matter, or fine particles, are tiny particles of solid or liquid suspended in a gas. In contrast, aerosol refers to particles and the gas together. Sources of particulates can be manmade or natural. Some particulates occur naturally, originating from volcanoes, dust storms, forest and grassland fires, living vegetation, and sea spray. Human activities, such as the burning of fossil fuels in vehicles, power plants and various industrial processes also generate significant amounts of aerosols. Averaged over the globe, anthropogenic aerosols—those made by human activities – currently account for about 10 percent of the total amount

of aerosols in our atmosphere. Increased levels of fine particles in the air are linked to health hazards such as heart disease, altered lung function and lung cancer.

As the size of the particles is small, they can penetrate deeply into the lungs [8],causing severe adverse respiratory problems. In one study, [5] found that exposure to PM smaller than 2.5 μm (PM2.5) significantly affects doctor–diagnosed asthmatic bronchitis

Based on their findings, Janssen et al. (2003) [9] agreed that exposure to particles smaller than 2.5 μm in indoor air is associated with cumulative asthma.

In a study of ultrafine particles, which are considered to penetrate more deeply into the respiratory system and skin barrier and cause more inflammation and oxidative damage than coarse particles

• Persistent free radicals connected to airborne fine particles could cause cardiopulmonary disease.

• Toxic metals, such as lead and mercury, especially their compounds.

• Chlorofluorocarbons (CFCs) - harmful to the ozone layer emitted from products currently banned from use.

• Ammonia (NH_3) - emitted from agricultural processes. Ammonia is a compound with the formula NH_3. It is normally encountered as a gas with a characteristic pungent odor. Ammonia, either directly or indirectly, is also a building block for the synthesis of many pharmaceuticals. Although in wide use, ammonia is both caustic and hazardous.

• Odors – such as from garbage, sewage, and industrial processes

• Radioactive pollutants – produced by nuclear explosions, nuclear events, war explosives, and natural processes such as the radioactive decay of radon.

Purpose

The purpose of this study is to confirm the eventual large increasement of the respiratory diseases that may occur as the result of polluted air. Also, the analysis of the number of patients affected by respiratory disease and the doubts that it may have on increasing the number of these patients.

Data

The data was provided by the Department of Hygiene and Epidemiology at the Tetovo and Gostivar Hospital Hospital . Total number for 2016/17 of patients affected by respiratory diseases.

Method

Accurate data analysis and how these patients are presented, each month, and in which season of the year are more pronounced

Age	Absolute number	Percentage
0-6 years old	8588	31.36366956
7-19 years old	7621	27.83215251
20-59 years old	8285	30.25710321
Above 60 years old	2888	10.54707472
	27382	100

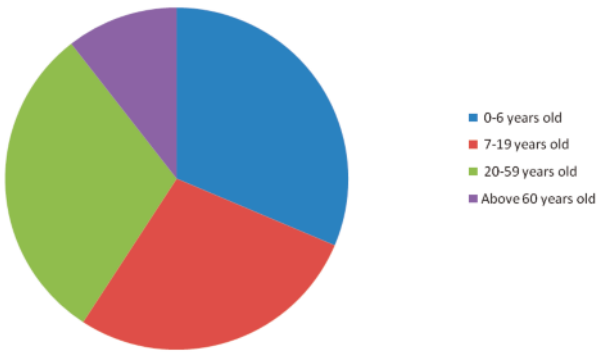


Fig 1. Upper respiratory tract infections in Gostivar region for 2017

Now we will find mean, median, population variance, sample variance, population standard deviation, sample standard deviation, coefficient of variation for above grouped data, taking into consideration maximum age 100.

Class	Frequency (f)	Mid Value (x)	$d=\frac{x-A}{h}=$ $=x-39.5$ $A=39.5, h=1$	$f\cdot d$	$f\cdot d^2$	$c\cdot f$
0-6	8588	3	-36.5	-313462	11441363	8588
7-19	7621	13	-26.5	-201956.5	5351847.25	16209
20-59	8285	39.5	0	0	0	24494
60-100	2888	80	40.5	116964	4737042	27382
	$n=27832$			$\sum f\cdot d=-398454.5$	$\sum f\cdot d^2=21530252.25$	

Mean $\bar{x}=A+\frac{\sum fd}{n}\cdot h=39.5-\frac{398454.5}{27382}=24.94983$.

To find median class =value of $\left(\frac{n}{2}\right)^{th}$ =value of 13691- st observation.

From the column of cumulative frequency cf, we find that the 13691- st observation lies in the class 7-19. The median class is 6.5-19.5. Now we denote:

L -lower boundary point of median class=6.5

n- total frequency=27832

cf= cumulative frequency of the class preceding the median class=8588

f= frequency of the median class =7621

c= class length of median class

Median: $M=L+\frac{\frac{n}{2}-cf}{f}c=6.5+\frac{13691-8588}{7621}13=15.2048$

Population variance:

$$\sigma^2=\left(\frac{\sum fd^2-\frac{\left(\sum fd\right)^2}{n}}{n}\right)h^2=\left(\frac{21530252.25-\frac{(-398454.5)^2}{27382}}{27382}\right)1^2=574.5404$$

Sample variance:

$$S=\left(\frac{\sum fd^2-\frac{\left(\sum fd\right)^2}{n}}{n-1}\right)\cdot h^2=\left(\frac{21530252.25-\frac{(-398454.5)^2}{27382}}{27381}\right)\cdot 1^2=574.5613$$

Population standard deviation:

$$\sigma=\sqrt{\left(\frac{\sum fd^2-\frac{\left(\sum fd\right)^2}{n}}{n}\right)}h=\left(\frac{21530252.25-\frac{(-398454.5)^2}{27382}}{27382}\right)^{1/2}=23.9696$$

Sample standard deviation

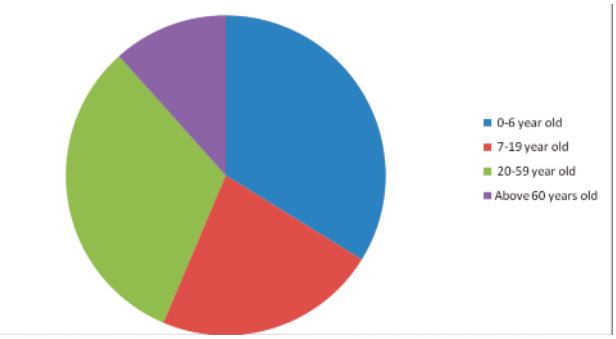
$$\sqrt{S}=\left(\frac{\sum fd^2-\frac{\left(\sum fd\right)^2}{n}}{n-1}\right)^{1/2}\cdot h=\left(\frac{21530252.25-\frac{(-398454.5)^2}{27382}}{27381}\right)^{1/2}=23.97$$

Coefficient of variation(population): $\frac{\sigma}{\bar{x}}\cdot 100\%=96.08\%$

Coefficient of variation(sample): $\frac{\sqrt{S}}{\bar{x}}\cdot 100\%=96.08\%$

Our results show that there are differences in the number of patients with respiratory system infections by age: children up to age 6 are affected by more, 31.3%. With 30.2% following the age of 20-59 years, the age of 7 -19 years is 27.8% and the least affected are those over 60 years with 10.54%.

Age	Absolute number	Percentage
0-6 year old	9007	33.81767665
7-19 year old	6011	22.5688969
20-59 year old	8520	31.98918675
Above 60 years old	3096	11.62423969
	26634	100



2.2. Upper respiratory tract infections in Gostivar region for 2017

Fig. 2 Upper respiratory tract infections in Gostivar region for 2017

Now we will present mean, median, population variance, sample variance, population standard

Mean: $\bar{x}=25.8836$

Median: $M=15.8212$

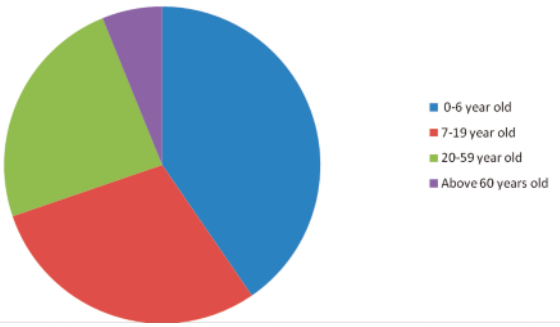
Population variance: $\sigma^2=614.2865$

Sample variance: $S=614.3096$

deviation, sample standard deviation, coefficient of variation for above grouped data, taking into consideration maximum age 100.

Our results show that there are differences in the number of patients with respiratory system infections by age: children up to age 6 are affected by more, 33.8%. With 31.9% following the age of 20-59 years, the age of 7 to 19 years is 22.5% and the least affected are those over 60 years with

Age	Absolute number	Percentage
0-6 year old	21054	40.40842178
7-19 year old	15290	29.34571906
20-59 year old	12551	24.08882406
Above 60 years old	3208	6.157035104
	52103	100



11.6%.

2.3. Upper respiratory tract infections data in

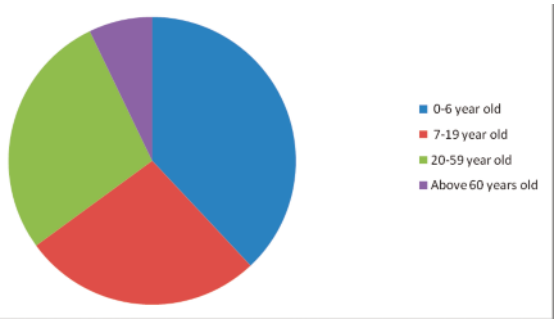
Mean: $\bar{x} = 19.4679$
Median: $M = 10.749$
Population variance: $\sigma^2 = 444.1276$
Sample variance: $S = 444.1362$
Population standard deviation: $\sigma = 21.0743$
Sample standard deviation: $\sqrt{S} = 21.0745$
Coefficient of variation(population): 108.25%
Coefficient of variation(sample): 108.25%.

Tetovo region for 2016

Fig. 3 Upper respiratory tract infections in Tetovo region for 2016

Our results show that there are differences in the number of patients with respiratory system infections by age: children up to age 6 are affected by more, 40.4%. With 29.3.2% following the age

Age	Absolute number	Percentage
0-6 year old	13873	37.98532391
7-19 year old	9860	26.99742621
20-59 year old	10172	27.85170582
Above 60 years old	2617	7.165544056
	36522	100



of 7-19 years, the age of 20-59 years is 24.0% and the least affected are over 60 years old with 6.15%

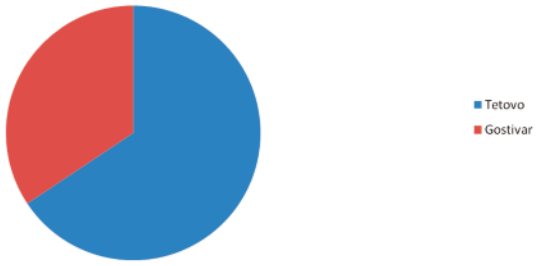
Mean: $\bar{x} = 21.3831$
Median: $M = 12.2854$
Population variance: $\sigma^2 = 484.9591$
Sample variance: $S = 484.9724$
Population standard deviation: $\sigma = 22.0218$
Sample standard deviation: $\sqrt{S} = 22.0221$
Coefficient of variation(population): 102.99%
Coefficient of variation(sample): 102.99%.

2.4. Upper respiratory tract infections data in Tetovo region for 2017

Fig. 4 Upper respiratory tract infections in Tetovo region for 2017

Our results show that there are differences in the number of patients with respiratory system infections by age: children up to 6 years of age are more affected, 37.9%. With 27.8% following the age of 20-59 years, the age of 7 -19 years is 26.9%

Tetovo	52103	65.658946
Gostivar	27251	34.341054
Total	79354	100



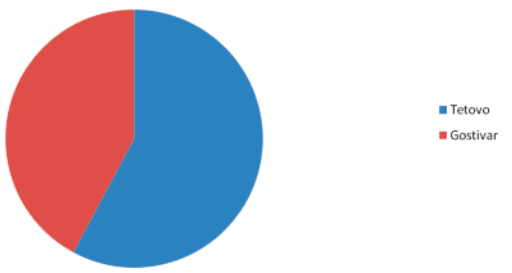
and the least affected are the age of over 60 years and it is 7.16%.

2.5. Difference of number of Upper respiratory tract infections in the City of Tetovo with Gostivar for 2016

Fig.5 Difference of number of Upper respiratory tract infections in the City of Tetovo with Gostivar for 2016

From the city-wide results, the largest number of patients belongs to the city of Tetovo and that

Tetovo	36522	57.82823485
Gostivar	26634	42.17176515
Total	63156	100



is 65.66%, while in Gostivar the total number for 2016 was 34.34%. However, it is important noting that Tetovo has more inhabitants.

2.6. Difference of number of Upper respiratory tract infections in the City of Tetovo with Gostivar for 2017

Fig. 6 .Difference of number of Upper respiratory tract infections in the City of Tetovo with Gostivar for 2017

In 2017, the number of patients affected by respiratory infections was 57.8%, while in Gostivar 42.1%.

3 CONCLUSIONS

Based on the data from the health institution of the Tetovo and Gostivar Hospital and statistical data processing, we conclude that air pollution has a major impact on the growth of patients affected by the respiratory system. Although we have only researched the upper respiratory tract infections, but being excited about the results, we can hardly conclude that the situation is worrisome to the huge increase in respiratory diseases. Also, suppose that air pollution can be one of the major factors for presenting these diseases.

Significantly observed in the results for the city of Tetovo, where for example in 2016 there were 52 103 patients affected by these diseases, whereas in 2017 there is a drastic drop also in 36 522 patients. This proves that in 2016 the air was more polluted in Tetovo due to known causes in the public (Jugohrom factory), so we conclude that with the improvement of ecological conditions we have decreased the number of patients affected by these infections.

We conclude that polluted air affects the enormous growth of respiratory system diseases.

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DEVELOPMENT OF NEW TECHNIQUES FOR ESTIMATION OF AIR, WATER AND SOIL QUALITY IN THE REPUBLIC OF MACEDONIA

SANI DEMIRI

"MOTHER TERESA" UNIVERSITY, FACULTY OF TECHNOLOGICAL SCIENCES, SKOPJE, REPUBLIC OF NORTH MACEDONIA, SANI.DEMIRI@UNT.EDU.MK

OLGA POPOVSKA

"MOTHER TERESA" UNIVERSITY, FACULTY OF TECHNOLOGICAL SCIENCES, SKOPJE, REPUBLIC OF NORTH MACEDONIA, OLGA.POPOVSKAI@UNT.EDU.MK

ARITA SABRIU-HAXHIJAHA

"MOTHER TERESA" UNIVERSITY, FACULTY OF TECHNOLOGICAL SCIENCES, SKOPJE, REPUBLIC OF NORTH MACEDONIA, ARITA.HAXHIJAHA@UNT.EDU.MK

ELIZABETA MISKOSKA-MILEVSKA

"SS CYRIL AND METHODIUS" UNIVERSITY, FACULTY F AGRICULTURE AND FOOD SCIENCES, SKOPJE, REPUBLIC OF NORTH MACEDONIA, MISKOSKA@YAHOO.COM

MONIKA LUTOVSKA

"MOTHER TERESA" UNIVERSITY, FACULTY OF TECHNICAL SCIENCES, SKOPJE, REPUBLIC OF NORTH MACEDONIA, MONIKA.LUTOVSKA@UNT.EDU.MK

AZIZ POLLOZHANI

"MOTHER TERESA" UNIVERSITY, FACULTY OF TECHNOLOGICAL SCIENCES, SKOPJE, REPUBLIC OF NORTH MACEDONIA, A.POLLOZHANI@UNT.EDU.MK

ZORAN T. POPOVSKI

SS CYRIL AND METHODIUS" UNIVERSITY, FACULTY OF AGRICULTURE AND FOOD SCIENCES, SKOPJE, REPUBLIC OF NORTH MACEDONIA, ZORAN_POPOVSKI@YAHOO.COM

ABSTRACT: One of the main imperatives to human civilization is the environmental protection as a precondition for its survival on Planet Earth. Therefore, scientists are in continuous race to discover and invent new approaches in environmental analyses. Each country, according to its needs, specificities and standard establishes monitoring system of air, water and soil pollution in order to prevent possible risks and consequences for its inhabitants. In the Republic of Macedonia there is a monitoring of all environmental media managed from state, local to institutional level regarding their competences and responsibilities. Unfortunately, not all parameters are included in that system, although some of them are very important and are closely related to human health. In order to improve the current monitoring system, "Mother Teresa" University developed new techniques that are not part of the routine in the institutions and laboratories dealing with this issue. In that sense, we implemented molecular technique for detection of bacterial species Legionella spp. using sophisticated DNA method known as Real Time PCR beside the conventional one which is time consuming and with the low level of sensitivity. In the field of freshwater monitoring, we modified

and validated a technique which is not on the list of the authorized laboratories, related to the so-called Surface Active Substances. It is also very important parameter which should be systematically followed in drinking water samples. And finally, beside the geochemical map of Macedonia for the presence of heavy metals in soil, we established a dynamic technique for following of the uptake of heavy metals from soil. For that purpose, the experiment with seedling of pepper on contaminated and non-contaminated soil was designed.

KEYWORDS: Environment, methods, Legionella, surface active substance, uptake, heavy metals.

1 INTRODUCTION

All monitoring programmes have reasons and justifications which are often designed to establish the current status of an environment. The design of a monitoring programme must therefore be related to the final use of the data before monitoring starts.

Air quality monitoring is challenging to integrate multiple environmental data sources, which often originate from different environmental networks and institutions [1]. These challenges require specialized observation equipment and tools to establish air pollutant concentrations, including sensor networks, geographic information system (GIS) models and the Sensor Observation Service (SOS). Air quality monitors are operated by citizens, regulatory agencies and researchers to investigate air quality and the effects of air pollution [2]. Interpretation of ambient air monitoring data often involves a consideration of health effects associated with exposure to the monitored levels if the interpretation reveals concentrations of multiple chemical compounds [3]. Air pollution can also be assessed by biomonitoring with organisms such as bacteria, lichens, mosses, fungi, and other. One of the benefits of this type of analysis is how information can be obtained via measurements of a representative of the environment from which they came. However, careful considerations must be taken in choosing the particular organism, how it's dispersed, and relevance to the pollutant [4]. And finally, air contamination can occur as a presence of pathogenic microorganisms that can be dispersed through the air.

Water quality monitoring is of little use without a clear definition of the reasons for the monitoring and the objectives that it will satisfy. The range of chemical parameters that have the potential to affect any ecosystem is very large and in all monitoring programs it is necessary to target a suite of parameters based on local knowledge and past practice for an initial review. The list can be expanded or reduced based on developing knowledge and the outcome of the initial surveys. Freshwater environments have been extensively studied for many years and there is a robust understanding of the interactions between chemistry and the environment across much of the world. However, as new materials are developed and new pressures come to bear, revisions to monitoring programs will be required [5].

Human-based pressures such as tourism, industrial activity, urban sprawl, construction work and inadequate agriculture/forestry practices can contribute to and make worse soil contamination and lead to the soil becoming unfit for its intended use. Both inorganic and organic pollutants may make their way to the soil, having a wide variety of detrimental effects. Soil contamination monitoring is therefore important to identify risk areas, set baselines, and identify contaminated zones for remediation [6]. Soil monitoring involves the collection and analysis of soil and it is associated to quality, constituents and physical status to determine its fitness for use. Soil monitoring helps characterize these and other potential risks to the soil, surrounding environments, animal health and human health [7]. Soil analysis has historically focused on more classical conditions and contaminants, including toxic elements

(e.g., mercury, lead, and arsenic) and persistent organic pollutants (POPs). However, as analytical techniques evolve and new knowledge about ecological processes and contaminant emerges, the focus of monitoring will likely broaden over time and the quality of monitoring will continue to improve [8].

Each country, according to its needs, specificities and standard, establishes monitoring system of air, water and soil pollution in order to prevent possible risks and consequences for its inhabitants. In the Republic of Macedonia there is a monitoring of all environmental media managed from the state, local to institutional level regarding their competences and responsibilities. However, not all parameters are included in that system, although some of them are very important and are closely related to human health and agriculture. The aim of this study was to develop new sensitive and applicable techniques that are not part of the routine in institutions and laboratories dealing with this issue.

2 MATERIAL AND METHODS

2.1 Detection of Legionella sp. in air conditioning devices using molecular tools

Conventional culture methods for detection of Legionella spp. present several disadvantages, including low sensitivity and long incubation periods (10 to 13 days of analysis for positive samples). This was the reason to decide to develop a molecular technique based on the detection of specific DNA sequence for Legionella sp. using Real Time PCR method.

The tests are based on amplification and detection of genomic sequences by the real-time PCR method using iQ-Check Screen Legionella spp. The kits contain all the ready-to-use reagents required in order to perform the analysis of the samples: PCR amplification solutions including Taq DNA Polymerase and internal control, specific fluorescent probes and primers, negative and positive controls. The reagents and the method were adjusted and optimized for use with ABI Prism thermal cycler 7500 system. During the PCR, the primers hybridize to the target region. The Taq DNA polymerase then uses these primers and deoxynucleotide triphosphates (dNTPs) to extend the DNA, creating copies of the target DNA called amplicons. During the PCR, a specific oligonucleotide probe hybridizes to the amplicons. This probe is marked with a fluorophore that emits fluorescence only when hybridized to the amplicons. The probes that bind to the target sequences of Legionella spp. are marked with the FAM fluorophore. When DNA target is present in the sample, the intensity of the fluorescence increases proportionally to the increase in the quantity of amplified products. The fluorescence ismeasured directly by the optical module of the thermal cycler during the hybridization step. The software, combined with the apparatus, displays in real time the intensity of the fluorescence measured according to the number of amplification cycles. For each reaction, the software determines a Cq, the cycle from which the fluorescence rises significantly above the background noise. The Cq values are correlated with the logarithm of the number of initial copies of the target sequence. For each sample, a synthetic internal control DNA is included in the amplification solution. It allows detection of any possible inhibition phenomena of the amplification reaction. The internal control is amplified at the same time with the same primers as the target sequences of Legionella spp., but it is detected by a probe marked with a different fluorophore (HEX Channel). These methods allow the detection of Legionella spp. in all samples in 4 hours, including the following steps: Sample collection and filtration, DNA extraction and PCR reaction for detection of Legionella spp.

Samples taken from the filters in the air conditioning devices served as an initial material for isolation of DNA. The AQUADIEN™ kit allows an

optimal DNA extraction and purification from bacteria present in the samples for Real Time PCR detection. The principle of the extraction is based on alkaline lysis of bacteria in presence of thermal shock and DNA purification using ultrafiltration. The kit has shown excellent results for Legionella real-time PCR analysis. DNA extraction and purification was performed using the following short protocol: Carefully fold the membrane in two, three times in order to obtain a cone; Using the tweezers, place the membrane in the tube containing 1 mL of R1; Incubate for 15 min at 95°C; 1,300 rpm in a stirrer heating block; Carefully take out the membrane by pressing it to the wall of the tube in order to recover all the lysate. Throw away the membrane; Centrifuge at 900 g for 3 min; Apply 500 µL of the supernatant on the purification column, without vortexing the lysate; Seal each column with the collector vial cap; Centrifuge for 10 min at 6000 x g. If the centrifuge temperature is programmable, adjust it preferably to 20°C; Add 100 µL of R2 solution in the purification column; Throw away the collector vial. Cover the purification column with a new clean collector vial and turn the whole upside down; Centrifuge at 1000 x g for 3 min. If the centrifuge temperature is programmable, adjust it preferably to 20°C. Throw away the purification column; Store the collector vial containing the 100 µL of purified DNA solution. Apply 5 µL of the DNA solution for each real time PCR reaction. The DNA solution can be stored for several months at -20°C [9].

The PCR mix preparation was performed using the following protocol. From the iQ-Check Screen Legionella spp. reaction mix take 40 µL of the Amplification mix and 5 µL of Fluorescent probes per well, according to the selected plate setup; add 5 µL of samples or controls; seal hermetically using the sealing tool; and Place the plate in the thermal cycler. Amplification reaction was run in RT PCR device after prior defining of the plate setup and selection and optimization of an appropriate thermo-protocol for the detection of Legionella as follow:

Hot start - 95 °C/2';

Denaturation - 95 °C/15'';

Annealing - 52 °C/20'';

Amplification - 72 °C/30'';

} 50 cycles

Terminal extension - 72 °C/5'.

Data analysis is automatically performed by appropriate software [10].

2.2 Determination of surfactants in drinking water

Several substances such as anionic (dodecyl sulphate, dodecyl benzene sulfonate), non-ionic, cationic (quaertenery ammonium salt) and amphoteric surfactants are used in different fields of industry including leather, paper, pharmacy, and they are also widely used in the households. From all the surfactants, the anionic surfactants (alkylbenzenesulfonates) are the most used surfactants and their greatest amount in the household is present as detergents and cleaning materials [11].

Their ability to decrease the surface tension as well as the chemistry of their own makes them very useful substances in many branches nowadays. The hydrophilic and hydrophobic character of the surfactants allow them to be used in the washing process in the household. In comparison to cationic surfactants, the rest of the surface-active compounds are not mainly classified as toxic substances. The consideration for the determination of surfactants is due to the ability of changing the oxygen and temperature mode in the water. The use of surfactants can be connected with products which can support many processes in terms of biodegradation and even the toxicity of other components and compounds in the environment.

The analysis of the surface-active compounds is

important not only for health issues, but they can also be classified as potential pollutants in the environment both in soil and in water. It is important to determine the concentration of the surfactants with accuracy and without many steps in the analysis.

A group of methods are reported in the literature including spectrophotometry and chromatography such as liquid and gas chromatography. One of the main disadvantages of all described methods is either requiring time consuming procedure in the analysis or optimizing pre-treatment steps [12]. The official method for the determination of surfactants tends to use chloroform in the procedure which is declared as a harmful substance. This method is based on the reaction between anionic substance and methylene blue, forming stable complex. The procedure itself involves 25 cm3 of the sample to be analyzed. To the sample, 100 cm3 distilled water is added and NaOH (1 mol·dm-3). And finally, 25 cm3 solution of methylene blue is added to the mixture. The liquid-liquid extraction is conducted with chloroform. The extraction is repeated three times with 5 cm3 chloroform. The absorbance is recorded at 652 nm.

The aim of this study was to use TLC method in the analysis of the potential presence of surface-active compounds due to the low cost, with ease to operate with and also the choice of adsorbents and solvents. The simplicity of the method is essential in order not to have many steps in the preparation of the analyzed sample.

Chemicals. Methanol and chloroform were supplied from Merck (Germany), while the standards of surfactants, dodecyl sulfate and heksadecyltrimethylamonium chloride were purchased from Sigma Aldrich (Germany).

The samples were collected from the tap drinkable water from Skopje, Gostivar and Tetovo in special sterilized flasks. On the other hand, the sample of not-drinkable water was chosen to be the river Vardar where the representative sample was chosen to be in the center of Skopje. Distilled water was also analyzed to determine the presence of surfactants in it.

For chromatographic determination, 2.5 μL of sample standard solutions were spotted on 20x20 cm Merck pre-coated TLC plates (60 F254, 250 μm). With the thin-layer chromatography method (TLC), standards of sodium dodecyl sulfate and heksadecyltrimethylamonium chloride were used in order to determine the value of retention factor (Rf). A chamber for TLC was prepared using methanol as solvent. After the plates were dried, the detection was performed under UV light (λ = 254 nm).

2.3 Determination of heavy metals uptake in plants

There are a lot of studies dealing with soil contamination with heavy metals in Macedonia and based on them a geochemical atlas of the Republic of Macedonia was issued in 2016. However, until now there was no designed experiment focusing on following the continuous uptake of heavy metals in plants. In this study, this was done using pepper as a model plant grown in contaminated and non-contaminated soil samples. The first one was taken from the surrounding fields of Lead-zinc smelting plant in Veles which was estimated many times in the past, while the second non-contaminated soil sample was taken from the fields around the village Oreshani which based on the mentioned geochemical atlas it is considered as green zone (zone free of heavy metals). Two soil samples were distributed in two pots with 77 seed places. The determination of lead was performed using atomic absorption spectrometry (AAS) in soils and vegetable.

Procedure for heavy metals determination in soils. Fine milled soil sample (1 g) was transferred in a glass beaker and 50 cm3 of acid mixture of

HCI and HNO3 (3:1) was added. A mixture was heated 3–4 h on a hot plate to obtain a minimum volume. Then, 50 cm3 of deionized water was added and the solution was filtered off. The filtrate was collected in a volumetric flask of 100 cm3.

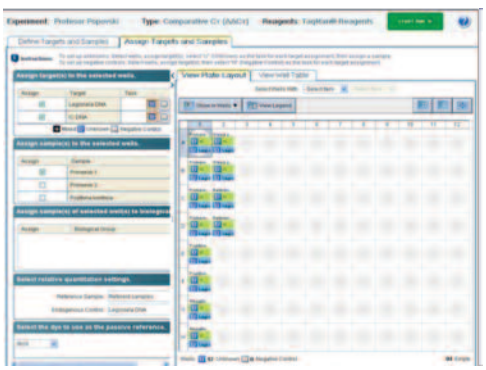
Procedure for heavy metals determination in food samples. Food samples (10 to 20 g) were put in an Erlenmeyer flask. 20 cm3 of hydrochloric acid solution was added, brought to a boil on a hot plate and simmered for 5 minutes. The solution was cooled, filtered and transferred to a 50 cm3 volumetric flask and made to volume with deionized water.

3 RESULTS AND DISCUSION

3.1 Molecular detection of Legionella spp.

The extraction and purification of DNA from air-conditioner filter samples was done using the producer guide for Aquadien kit (9). The extracted DNA was not quantified and checked by agarose gel electrophoresis, but it was directly used for detection of Legionella spp. presence in initial material.

Due to the fact that the kit for screening of Legionella spp. was not fully appropriate with the available RT PCR device (it was provided from the company which usually recommends its devices), it was necessary to optimize the conditions for Real Time PCR. The optimized conditions are presented in Fig. 1.



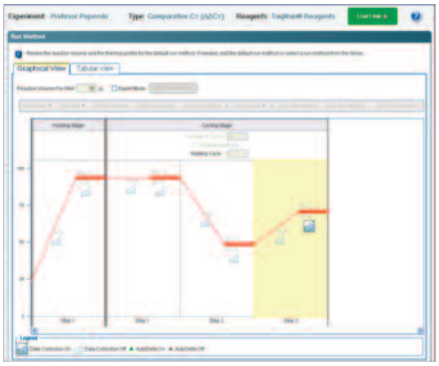


Fig. 1. Optimized conditions for RT PCR for the detection of Legionella spp. A) Setup the reaction plate. B) Run conditions.

In one of our samples we obtained the presence of Legionella spp., and it is shown in Fig. 2.

Fig. 2. Results from the detection of Legionella spp. in samples from air-conditioner filters.

A) Negative result; B) Positive result.

Legionellae bacteria are gram positive and pathogenic agents causing serious lung diseases. They are the cause of an acute pneumonia, Legionnaire's disease and a milder form of pulmonary infection, Pontiac fever. In Europe, the number of declared cases of Legionnaire's disease increases by 25% per year. Detection of legionellae is compulsory or strongly recommended in most developed countries. As aerosols are the unique vectors of these bacteria, regular air controls are crucial step in preventing outbreaks.

3.2 Surfactants in drinking water

Selection of the solvent. The selection of the solvent was based on the solubility of the sub-

stances in methanol and as less harmful organic solvent.

The preliminary testing for the presence of any kind of surfactants such as anionic, cationic and non-ionic was with the use of the TLC method. The product was of analytical purity as indicated by TLC (one spot), without detectable impurities.

The determined Rf values for dodecyl sulphate and heksadecyltrimethylamonium chloride were 0.85 and 0.92, respectively (Fig. 3a). On one hand, there was an absence of potential surfactants in the samples of the drinkable tap water from Skopje, Gostivar and Tetovo, and distilled water, and on the other hand, there was a positive result for potential presence of the anionic surfactant from the river Vardar in the comparison to the standard of the surfactant active substance (Fig. 3b).

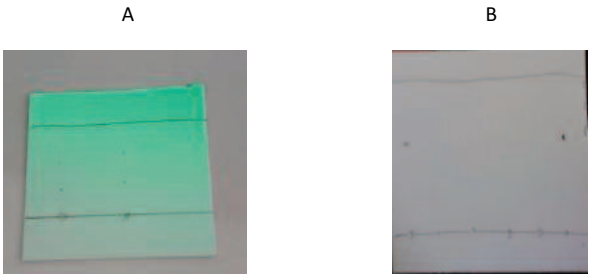


Fig. 3. Developed TLC plates. A) Standards of surfactants; B) Samples of water.

The development of the spots in organic solvents was fast with the use of TLC method. This method was chosen due to the advantages over the other methods such as rapidity and without consuming a great amount of potentially harmful substances. It can also be used in routine analysis for the determination of surfactants.

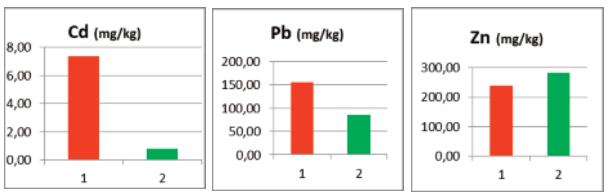
Although the choice of the surfactant has a tendency of using those which are easily biodegradable, side effects and reactions are always present. The determination of surfactants should be considered not only in the drinkable water, but also in the waste water from the households and industry.

3.3 Heavy metals uptake in plants

The soil samples from the surrounding fields of Veles smelting plant for lead and zinc as contaminated oness and from village Oreshani as non-contaminated ones were analyzed in order to determine the starting point of the presence of heavy metals. Those samples were dispersed in two pots. (Fig. 4).

Fig. 4. Experimental pots with contaminated and non-contaminated soil.

The results from this initial estimation are shown in Graph. 1.



Graph 1. Presence of Cd, Pb and Zn in soil samples taken from the vicinity of lead-zinc smelter near Veles (red peak - average value, green peak – permitted level).

In the last 30 years, professor Trajce Stafilov with his team from the Institute of Chemistry as a part of the Faculty of Natural Sciences in the frame of "Ss. Cyril and Methodius" University in Skopje, Republic of Macedonia, have performed a lot of studies on heavy metals pollution in the country, especially around the mines and accompanying processing industries (13). Using modern and sensitive methods for quantification of heavy metals by biomonitoring, soil, air, water and food samples were analyzed. Special attention was put on the environmental pollution in the specific mining and metallurgical areas, especially around

lead smelter plant in Veles.

For the first time, we are following the uptake of the present heavy metals in the pepper plants during the vegetation and results will be published soon with suggestions for possible remediation of the contaminated soil.

4 CONCLUSIONS

Our study shows that there is a potential in the academic community in the country for the development of new, modern, sensitive and reliable techniques which can be used for monitoring air, water and soil contamination beside the current ones. The presented new or modified methods for identification of Legionella spp. in air, surfactants in fresh drinking water and dynamic uptake of heavy metals in crops are the ones that can be included as a part of the current monitoring system in the Republic of Macedonia.

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MODELLING AND OPTIMIZATION OF PHYSICAL CHARACTERISTICS BASED ON UV-VIS/NIR SPECTRA OF AQUEOUS EXTRACTS OF LAVENDER, MINT AND MELISSA

TAMARA JURINA

University of Zagreb, Faculty of Food Technology and Biotechnology, Croatia, tlekic@pbf.hr

ANA-MARIJA CVETKOVIĆ

University of Zagreb, Faculty of Food Technology And Biotechnology, Croatia, anamarijacvetkovic@hotmail.com

JASENKA GAJDOŠ KLJUSURIĆ

University of Zagreb, Faculty of Food Technology and Biotechnology, Croatia, jgajdos@pbf.hr

ANA JURINJAK TUŠEK

University of Zagreb, Faculty of Food Technology and Biotechnology, Croatia, atusek@pbf.hr

MAJA BENKOVIĆ

University of Zagreb, Faculty of Food Technology and Biotechnology, Croatia, mbenkovic@pbf.hr

DAVOR VALINGER

University of Zagreb, Faculty of Food Technology and Biotechnology, Croatia, dvaliger@pbf.hr

ABSTRACT: Plants belonging to Lamiaceae family contain a large number of naturally occurring compounds, with important antioxidant activities. They are often used in traditional and modern medicine, food industry, cosmetics and pharmaceutical industry. UV-VIS/NIR spectroscopy, in combination with chemometrics, is often applied to build models for qualification and quantification of the major compounds in many agricultural products and plant materials. The aim of this work was to investigate the applicability of UV-VIS/NIR spectroscopy for prediction of electrical conductivity (G) and total dissolved solids (TDS) of lavender (Lavandula x hybrida L.), melissa (Melissa officinalis L.) and mint (Mentha piperita L.) aqueous extracts. Plant extracts were prepared by conventional aqueous extraction at T = 40, 60, 80 °C, rpm = 500 min-1 and sampled at regular time intervals (t = 0.5, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 70, 80, 90 min). Principal Component Analysis (PCA) and Partial Least Squares Regression (PLS) were used for qualitative and quantitative analysis of the recorded UV-VIS/NIR spectra of each extract. PLS models provided very good prediction of G and TDS for mint extracts (T = 40 °C) using UV-VIS/NIR spectra in the spectral range of λ = 400 – 1699 nm. Determination coefficients were higher than R2 = 0.9, for both model prediction and model validation. The ratio of standard error of performance to standard deviation (RPD) was greater than 3 indicating good quantitative application of developed models. The results show that UV-VIS/NIR spectroscopy, in combination with multivariate analysis, has a promising potential to qualitatively and quantitatively predict the physical characteristics of plant materials.

KEYWORDS: Medicinal plants; UV-VIS/NIR spectroscopy; Principal Component Analysis; Partial Least Squares regression (PLS)

1 INTRODUCTION

Polyphenolic compounds are commonly found in medicinal plants and they have been reported to have multiple biological effects, including antioxidant activity [1]. Medicinal plants can be used in many domains, including medicine, nutrition,

flavoring, beverages, dyeing, repellents, fragrances and cosmetics [2,3]. Among them, plants from the Lamiaceae family are the most used and commercialized species with good antioxidant and antimicrobial activity [4]. They are often used in traditional and modern medicine, food industry, cosmetics and pharmaceutical industry [3]. Various species of the genera exhibit significant antioxidant activities and are often used for treatment of wounds, gastritis, infections, dermatitis, bronchitis, and inflammation [5,6]. Numerous analytical techniques for qualitative and quantitative analyses of bioactive compounds have been developed over the years. These methods are precise but costly, requiring many reagents, time-consuming and are not environmentally friendly [7,8]. Spectroscopic techniques have become one of the most attractive and frequently used methods of analysis, providing simultaneous, rapid and non-destructive quantification of the major components in many agricultural products and plant materials [9-11]. Among them, Near Infrared spectroscopy (NIRs) plays an important role due to reliability, quick data analysis, versatility, precision, simple, non-destructive and on-line measurements [12]. NIR involves the absorbance of light mainly caused by overtones and combinations of fundamental vibrations of hydrogen bonds such as C–H, N–H, O–H. However, NIRs absorption spectra are often very complex and contain broad overlapping, making it difficult to obtain feature information of interest that could be measured at specified wavelengths obtained using spectrophotometric or colorimetric determinations [13]. To overcome these limitations, ultraviolet-visible (UV-VIS) absorption bands associated with the presence of different chromophores (C=C, C=O) and auxochromes (–OR, –OH) can be used [14]. UV-VIS spectroscopy can be used for quantitative analyses since aromatic compounds are powerful chromophores in the UV range [15]. Multivariate statistical techniques are often very useful for processing of UV-VIS and NIR spectra. The big advantage of these statistical methods lies in the fact that they can be used to extract the information of recorded spectra and explore this spectral information for qualitative and quantitative applications [16]. The aim of this work was to investigate the applicability of UV-VIS/NIR spectroscopy for prediction of physical properties of lavender, melissa and mint aqueous extracts. The extracts were prepared by solid-liquid extraction, at three different temperatures (40 °C, 60 °C and 80 °C). Recorded UV-VIS/NIR spectra of the extracts were related to their previously measured physical characteristics (electrical conductivity and total dissolved solids) by applying chemometrics. Principal Component Analysis (PCA) was applied in order to describe similarities and differences between plant extracts while the Partial Least Squares Regression (PLSR) model was built from the obtained spectral data to quantify electrical conductivity and total dissolved solids of the plant samples.

2 EXPERIMENTAL AND COMPUTATIONAL DETAILS

2.1 Plant materials

Lavender (Lavandula x hybrida L.), melissa (Melissa officinalis L.) and mint (Mentha piperita L.) were purchased from a specialized herbal store (Suban d.o.o., Zagreb, Croatia). Plant materials were collected during the flowering season of 2015 in the north-western part of Croatia, dried naturally and stored at ambient conditions until used.

2.2 Extraction procedure

Plant extracts were prepared by conventional aqueous extraction. An amount of m = 30 g of dry plant material was placed in a V = 2000 mL glass with V = 1500 mL of deionized water, covered with aluminum foil, and heated to T = 40, 60, 80 °C ± 0.5 °C using Ika HBR4 digital oil-bath (IKA-Werk GmbH & Co.KG, Staufen, Germany). Experiments were performed with the plant material particle size range of d = 3000 – 4000 μm, at the magnetic stirrer rotational speed of 500 rpm during t = 90

min. V = 5 mL samples were taken at regular time intervals (t = 0.5, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 70, 80 and 90 min). Samples were immediately cooled in the water-ice mixture, filtered through a 100 % cellulose paper filter (LLG Labware, Meckenheim, Germany) with d = 5–13 μm pore size and stored at T = 4 °C until analyses. The selected temperatures and extraction conditions were chosen based on a set of preliminary experiments (data not shown).

2.3 Determination of electrical conductivity and total dissolved solids

Electrical conductivity (G) and total dissolved solids (TDS) of lavender, melissa and mint extracts were determined using a Seven Compact conductometer (Mettler Toledo, Switzerland). After cooling the extracts to room temperature, a probe was submerged into the extracts and left until the electrical conductivity/total dissolved solids on the conductometer stabilized.

2.4 NIR spectroscopy

Recordings of the lavender, melissa and mint exctracts spectra, in the near infrared region (λ = 904 – 1699 nm), were performed using NIR spectrophotometer NIR128L-1.7 (Control Development, South Bend, Indiana, USA) with installed Control Development software Spec32 using a halogen light source (HL-2000) with a spectral resolution of 6.25 cm-1. The NIR spectra of plant extracts, prepared at three different temperatures, were collected with the setup for NIRs studies previously described by Valinger et al. (2011) [17]. Measurements were carried out in triplicate and the average spectrum of each extract was used for analysis.

2.5 UV-VIS spectroscopy

Lavender, melissa and mint extracts were also scanned by a UV-VIS spectrophotometer (Biochrom Libra S11, Cambridge, England) with Acquire LITE software, in the range λ = 325 – 900 nm. Measurements were carried out in triplicate and the average spectrum of each extract was used for analysis.

2.6 Multivariate data analysis

Principal Component Analysis (PCA) is a main dimension-decreasing method of the spectral data set by explaining a large part of the variance using synthetic factors, called principal components (PCs) [13,18]. By performing PCA on spectral data, it is possible to draw similarity maps of the samples and to get spectral patterns. These spectral patterns, corresponding to PCs provide information about characteristic peaks which are the most discriminating for the samples observed on the similarity maps [18]. Partial Least Square Regression (PLSR) is a modelling method used to detect relationships between a set of independent spectral variables (X) and a single dependent variable (Y): it is a regression method, often used for development of classification models [19]. In our case, dependent variables were total dissolved solids (TDS) and electrical conductivity (G). PCA and PLSR were performed using the Unscrambler X software, version 10.5 (CAMO Software, Oslo, Norway). For the model evaluation, following parameters were used: (i) the root-mean-square error of calibration (RMSE); (ii) the coefficient of determination for cross validation (R2V); (iii) root-mean-square error of prediction (RMSEP); (iv) Residual Predictive Deviation (RPD), calculated as the ratio of the standard deviation (SD) of the reference data to the RMSEP and (v) the Range Error Ratio (RER), defined as the ratio of the data range to the RMSEP.

3 RESULTS AND DISCUSSION

3.1 Electrical conductivity (G) and total dissolved solids (TDS)

According to the data obtained from preliminary experiments, temperature had the highest influence on the yield of the solid-liquid extraction process. Three different extraction temperatures (T = 40, 60 and 80 °C) were chosen in this study. Physical characteristics (electrical conductivity and total dissolved solids) of the prepared

plant extracts were determined and results are presented in Figs. 1a-1f. Electrical conductivity and total dissolved solids increased with the increase of the extraction temperature, which is in agreement with the previously published results [20]. Values of G and TDS at T = 80 °C where: G = 1131 μS cm-1 and TDS = 566 mg L-1 for lavender extracts, G = 1945 μS cm-1 and TDS = 973 mg L-1 for melissa extracts and G = 1660 μS cm-1 and TDS = 830 mg L-1 for mint extracts, respectively.

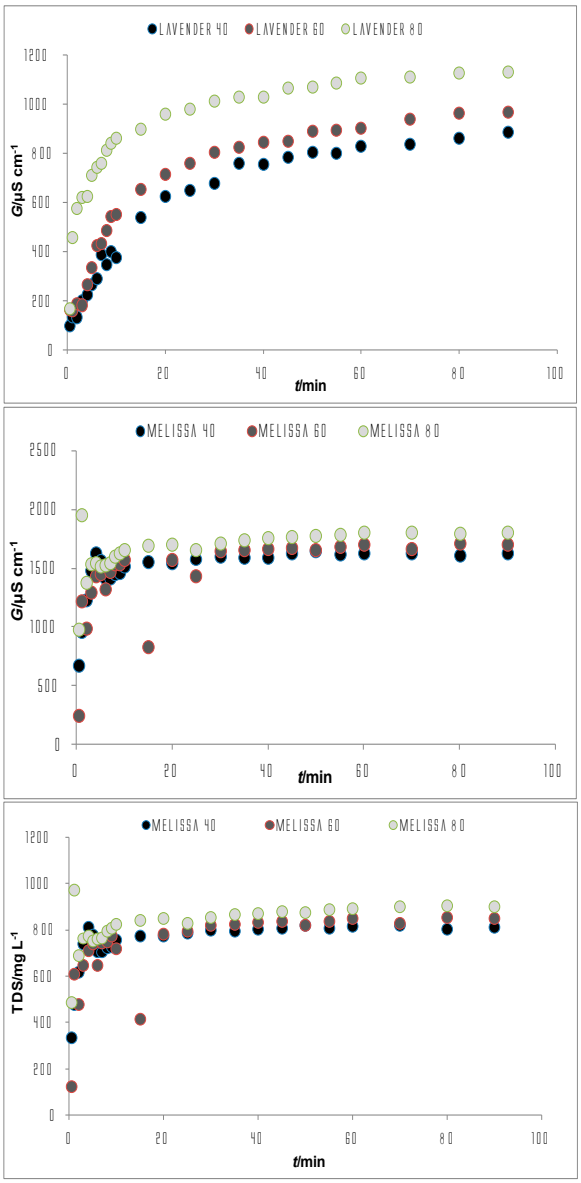
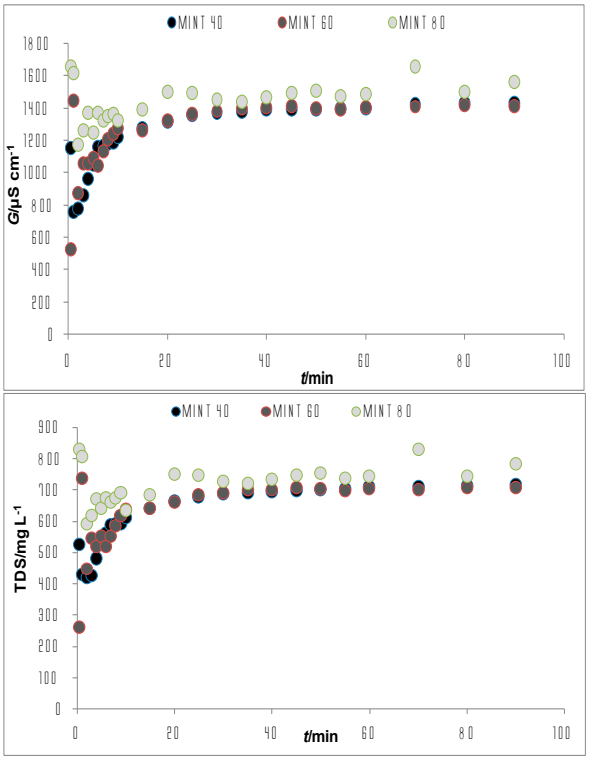


Fig. 1. Changes of G (a, b, c) and TDS (d, e, f) over time for (a & d) lavender extracts, (b & e) melissa extracts and (c & f) mint extracts extracted at three different temperatures (T = 40 °C, 60 °C and 80 °C)



3.2 UV-VIS/NIR spectra

Using the UV-VIS spectrophotometer and the NIR instrument, each spectra of three different plant extracts, extracted at three different temperatures, were recorded in triplicate. Examples of UV-VIS and NIR raw spectra for lavender, melissa and mint extracts are presented in Fig. 2. Based on the recorded UV-VIS/NIR spectra, it is not possible to distinguish different plant samples, regardless the extraction temperature (40 °C, 60 °C and 80 °C). Spectra obtained in the range from 325 nm to 1699 nm did not show visible differences or spectral shifts.

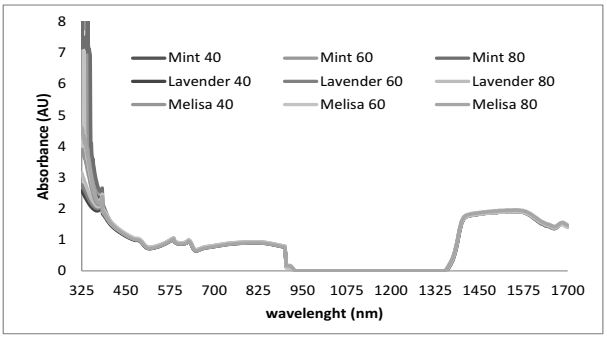


Fig. 2. UV-VIS/NIR spectra for extract of different plants (mint, melissa and lavender) extracted at different temperatures (T = 40 °C, 60 °C and 80

°C).

3.3 Principal Component Analysis (PCA)

In order to investigate the qualitative differences on the total data set, UV-VIS/NIR spectra matrix was used to perform the Principal Component Analysis (PCA). PCA is one of the most often used multivariate techniques for identifying patterns in large set of data and express the data to highlight similarities and differences among them [21]. The PCA analysis based on the UV-VIS/NIR spectra showed no qualitative grouping based on the plant source or extraction temperature (Fig. 3A) while the use of average values showed differentiation based on the plants, especially for the mint samples that are positioned in the 3rd quadrant, regardless the extraction temperature (Fig. 3B).

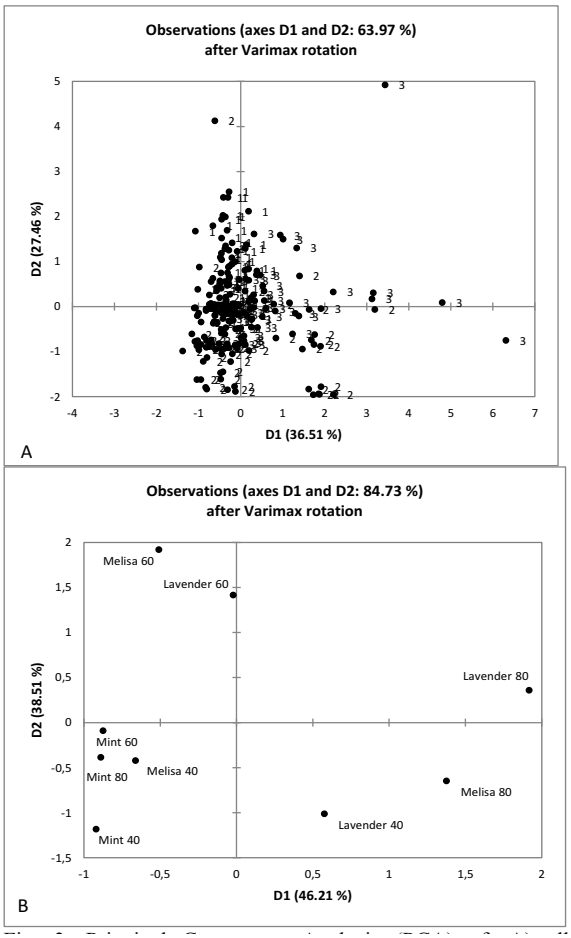


Fig. 3. Principal Component Analysis (PCA) of: A) all samples (1 = Mint; 2 = Lavender and 3 = Melisa) and B) the average values for the last measurement (in the 90th minute)

3.4 Partial Least Squares Regression (PLSR)

In order to determine whether spectral data and measured TDS and G show any kind of correlation, Partial Least Squares Regression (PLSR) modelling was conducted. UV-VIS/NIR spectra data matrix was used as input data while TDS or G were used as output.

Firstly, the whole UV-VIS/NIR spectrum (⚜ = 350-1699 nm) was utilized and the second spectra part used was in the range of ⚜ = 400-1699 nm. PLSR models were then applied. The plants were divided by the extraction conditions (T = 40 °C, 60 °C and 80 °C) and the models were presented in Table 1. Calculated determination coefficients for calibration (R2v) and model validation (R2p), root mean squared error values of the calibration (RMSE) and validation (RMSEP), residual predictive deviation (RPD) and range error ratios (RER) were applied to estimate the prediction ability of PLSR model. Results showed that the best PLSR model was obtained for lavender extracts, regardless the extraction temperature and wavelength range.

R2v and R2p values for lavender extracts were higher than 0.9, RPD ratios ranged from 3.453 – 5.910 while RER values ranged from 10.706 – 18.674. Obtained RMSEP values were slightly higher, compared to the RMSE values (Table 1). The same trend, regarding determination coefficients and root mean squared error for calibration and validation, were observed for melisa and mint extracted at T = 40 °C (for spectral range from ⚜ = 400 – 1699 nm) and mint extracts prepared at T = 60 °C (using both spectral range). The Residual Predictive Deviation is widely used in evaluation of NIRs research for assessing the efficiency of NIR predictions. RPD values between 3 and 5 indicate efficient NIR predictions [22,23]. Suggested RPD and RER values for quantitative models are RPD > 3 and RER > 10 [24].

The effectiveness of low R2p and RPD at the limit of eligibility is shown in Fig. 4.

Although all R2p do not meet the limit recom-

Table 1. Partial linear squares regression models presented with the root-mean-squared error of the calibration and validation (RMSE and RMSEP), the associated coefficients of determination for the calibration (R^2_v) and validation (R^2_p), the residual predictive deviation (RPD) and the range error ratios (RER) of individual and total plant samples

plant	λ (nm)	Observed parameter	RMSE	R^2_v	RMSEP	R^2_p	RPD	RER
Melissa 40	350-1699	TDS (mg L^{-1})	36.127	0.911	43.201	0.862	2.665	11.319
		G (μS cm^{-1})	72.079	0.911	86.203	0.862	2.664	11.369
	400-1699	TDS (mg L^{-1})	18.471	0.977	28.840	0.940	3.992	16.956
		G (μS cm^{-1})	37.184	0.978	57.740	0.940	3.978	16.973
Melissa 60	350-1699	TDS (mg L^{-1})	95.484	0.718	106.042	0.612	1.594	6.874
		G (μS cm^{-1})	198.425	0.697	217.858	0.592	1.552	6.734
	400-1699	TDS (mg L^{-1})	95.589	0.717	111.929	0.572	1.510	6.512
		G (μS cm^{-1})	173.986	0.768	210.493	0.627	1.607	6.969
Melissa 80	350-1699	TDS (mg L^{-1})	45.323	0.800	49.429	0.730	1.926	9.873
		G (μS cm^{-1})	87.309	0.815	105.351	0.699	1.806	9.255
	400-1699	TDS (mg L^{-1})	12.736	0.984	45.342	0.778	2.099	10.763
		G (μS cm^{-1})	17.656	0.992	84.034	0.810	2.264	11.602
Lavender 40	350-1699	TDS (mg L^{-1})	26.809	0.962	29.020	0.956	4.673	14.104
		G (μS cm^{-1})	52.034	0.968	56.611	0.957	4.748	13.928
	400-1699	TDS (mg L^{-1})	34.335	0.937	37.242	0.926	3.641	10.990
		G (μS cm^{-1})	68.362	0.936	73.652	0.926	3.649	10.706
Lavender 60	350-1699	TDS (mg L^{-1})	21.878	0.976	24.186	0.969	5.820	16.799
		G (μS cm^{-1})	42.565	0.977	47.734	0.971	5.910	16.938
	400-1699	TDS (mg L^{-1})	23.428	0.972	27.805	0.961	5.063	14.612
		G (μS cm^{-1})	46.774	0.972	54.891	0.962	5.139	14.729
Lavender 80	350-1699	TDS (mg L^{-1})	27.737	0.951	27.676	0.956	4.390	17.383
		G (μS cm^{-1})	56.123	0.950	51.661	0.955	4.705	18.674
	400-1699	TDS (mg L^{-1})	29.976	0.943	35.030	0.918	3.468	13.734
		G (μS cm^{-1})	60.161	0.943	70.396	0.917	3.453	13.704
Mint 40	350-1699	TDS (mg L^{-1})	31.745	0.893	29.990	0.907	3.297	9.903
		G (μS cm^{-1})	88.135	0.807	81.920	0.842	2.523	8.240
	400-1699	TDS (mg L^{-1})	36.537	0.971	22.474	0.948	4.400	13.215
		G (μS cm^{-1})	42.610	0.954	54.496	0.930	3.792	12.386
Mint 60	350-1699	TDS (mg L^{-1})	42.434	0.871	36.420	0.889	3.013	13.134
		G (μS cm^{-1})	75.259	0.898	64.797	0.912	3.369	14.270
	400-1699	TDS (mg L^{-1})	39.269	0.889	36.971	0.885	2.968	12.938
		G (μS cm^{-1})	75.041	0.898	71.156	0.892	3.068	12.995
Mint 80	350-1699	TDS (mg L^{-1})	34.360	0.689	43.344	0.520	1.441	5.479
		G (μS cm^{-1})	71.017	0.653	87.018	0.495	1.413	5.597
	400-1699	TDS (mg L^{-1})	22.165	0.871	26.348	0.823	2.371	9.014
		G (μS cm^{-1})	42.419	0.877	51.659	0.824	2.380	9.427
All in one document	350-1699	TDS (mg L^{-1})	69.875	0.907	88.2823	0.849	2.542	10.651
		G (μS cm^{-1})	157.422	0.822	184.899	0.834	2.49	10.003
	400-1699	TDS (mg L^{-1})	82.525	0.870	88.554	0.845	2.534	10.618
		G (μS cm^{-1})	157.556	0.867	178.217	0.843	2.520	10.378

mended for routine application (R2p > 0.6) [22], especially for mint samples extracted at 80 °C and melissa samples extracted at T = 60 °C, the PLSR modelling could be applied for the prediction of TDS and G of lavender, melissa and mint extracts based on their recorded spectra, taking all three analysed plants as one input data set.

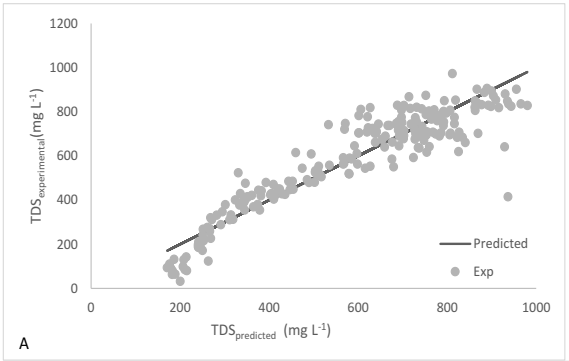
Fig. 4. Prediction successes of TDS (A) and G (B) for all samples in one input data set

Although all R2p do not meet the limit recommended for routine application (R2p > 0.6) [22], especially for mint samples extracted at 80 °C and melissa samples extracted at T = 60 °C, the PLSR modelling could be applied for the prediction of TDS and G of lavender, melissa and mint extracts based on their recorded spectra, taking all three analysed plants as one input data set.

4 CONCLUSIONS

The experimental results showed that temperature had a significant influence on the solid-liquid extraction of electrical conductivity and total dissolved solids from lavender, mellisa and mint.

The prediction of the physical characteristics of the investigated plant samples, based on the



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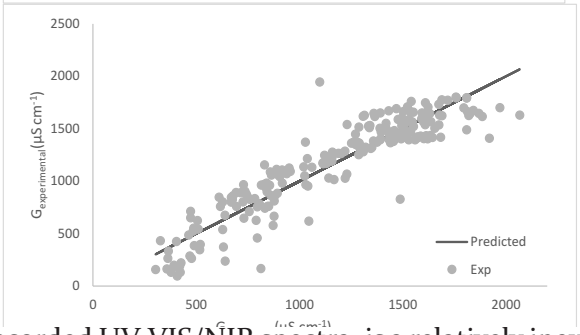

recorded UV-VIS/NIR spectra, is a relatively inexpensive, rapid, reliable and eco-friendly method, compared to standard analytical methods. In this study, PCA and PLSR analysis were performed for qualitative and quantitative analysis of the recorded UV-VIS/NIR spectra of each plant extract. Although PCA didn't show qualitative differentiation based on the plant source or extraction temperature, PCA analysis using average values showed differentiation based on the plant species, especially for the mint samples, regardless the extraction temperature. Developed PLSR model showed linear correlation between UV-VIS/NIR spectra and G or TDS for all samples taken in one input data set. Best models were obtained for lavender extracts, regardless the extraction temperature.

The results show that UV-VIS/NIR spectroscopy, in combination with multivariate analysis, has a promising potential for monitoring physical properties of medicinal plant extracts in terms of quality control of the final product.

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ANALYSES OF POSSIBILITIES OF FLIPPED CLASSROOM IN TEACHING INFORMATICS COURSES

MIRLINDA EBIBI
Mother Teresa University, Faculty of technical sciences, Skopje, North Macedonia, mirlinda.ebibi@unt.edu.mk
MAJLINDA FETAJI
South East European University, Computer Sciences, Tetovo, North Macedonia, m.fetaji@seeu.edu.mk
MARIKA APOSTOLOVA
South East European University, Computer Sciences, Tetovo, North Macedonia

ABSTRACT: The research study investigates the benefits of the flipped learning pedagogy focusing on assessment of learners on their attitudes, motivation, and effectiveness when using flipped learning compared with traditional classroom learning. The flipped classroom is a new pedagogical model where lectures and lab classes with practical elements of a course are given to students prior to their class. Short content and video lectures are required to be viewed by students at home before the class session, while in-class time learners have to do exercises, projects, or discussions. It is kind of a reverse classical classroom. Using new technologies students can organize their learning process independently and become an active learner instead of the passive learner Four broad categories of instructional approaches for use in an flipped learning have been identified: (a) individual activities, (b) paired activities, (c) informal small groups, and (d) cooperative student projects. The research study is based on the theory of Bloom's revised taxonomy of cognitive domain. This taxonomy provides six levels of learning discussed in the research methodology section. In order to analyze all this, a case study experiment was realized and insights as well as recommendations are presented.

KEYWORDS: Flipped classroom, programming robotics, effectiveness of learning, flipped learning paradigm

1 INTRODUCTION

As a relatively new model of instruction, educators understandably desire evidence that the Flipped Learning model has a positive impact on important student outcomes, including achievement and engagement.

The flipped classroom is a new pedagogical model where lectures and lab and practical elements of a course are given to students prior to their class. Short lecture content and video lectures are required to be viewed by students at home before the class session, while in-class time learners have to do exercises, projects, or discussions. It is kind of a reverse classical classroom.

Traditional teaching has a limited time to repeat the lecturing in class time. But flipped learning gives the control to students. They can review, replay, rewind, and fast-forward the learner content and video as needed [3]. Thus, students feel free to learn the lesson content anytime, and any missed classes can be watched with lower stress repeatedly [7]. That carries the individual learning facilities out of the classroom walls. Also students come to the class with questions regarding the topics.

2 LITERATURE REVIEW

The aim of the literature review is to determine the trends in publications concerned with the

flipped classroom concept during the period between 2010 and 2018.

To counter some of the misconceptions about this term, the governing board and key leaders of the Flipped Learning Network (FLN), all experienced Flipped Educators, have composed a formal definition of "Flipped Learning." Explicitly defining the term may dispel some of the myths repeatedly promulgated by teachers, the media, and researchers.

These Flipped Learning leaders also distinguish between a Flipped Classroom and Flipped Learning. These terms are not interchangeable. Flipping a class can, but does not necessarily, lead to Flipped Learning. Many teachers may already flip their classes by having students read text outside of class, watch supplemental videos, or solve additional problems, but to engage in Flipped Learning, teachers must incorporate the following four pillars into their practice.

The flipped classroom is an approach to teaching and learning activities where students watch a video lesson outside the class through distance learning and have hands-on activities in the class. According to [6] note that the flipped classroom or reverse classroom is an element of blended learning, integrating both face-to-face learning in the class through group discussion and distance learning outside the class by watching asynchronous video lessons and online collaboration.

Flipped classroom is also known as a student-centred approach to learning where the students are more active than the instructor in the classroom activity. In this case, the instructor acts as a facilitator to motivate, guide, and give feedback on students' performance [5]. Hence, by applying the flipped classroom approach to teaching and learning activities, the instructor can move the traditional lecturer's talk to video and the students can listen to the lectures anywhere outside of class. The flipped classroom allows students to watch the video according to their preferred time and need, and they can study at their own pace; this type of activity also increases students' collaborative learning in distance education outside the class. Thus, by flipping the class, the students will not spend so much time listening to long lectures in the classroom, but will have more time to solve problems individually or collaboratively through distance learning with peers.

With the flipped model [7], the lower levels are presented before class through recorded lectures and video. Readings, simulations, and other materials also provide this foundational support for learning so that in-class time can be spent working on higher levels of learning from application to evaluation. In flipped classrooms, students go from the lowest level (remembering) to achieve the highest level (creating). [9] mentioned that the flipped classroom focuses on how to support the learners in achieving a higher level of the taxonomy domain. Additionally, [5] added that in flipped learning, classroom activity is spent on application and higher-level of learning rather than listening to lectures and other lower-level thinking tasks. As shown in Table 1, implementing flipped learning allows the students to spend more time supporting higher-level learning tasks such as a group discussion, while lower-level tasks such as knowledge and comprehension are completed independently outside the class.

See and Conry (2014) provided a unique flipped classroom model for a clinical pharmacy practice faculty. The faculty instructors were required to watch a YouTube origami video on "How to make a paper crane" along with a Prezi presentation. They were then asked to build their own crane and send a picture of it to the facilitators by the set deadline. In-class activities included a quiz on the homework, evaluation and feedback of the cranes provided by faculty instructors along with individual, small and large group reflections. This study was successful in sensitizing faculty to the flipped classroom approach, which means that this faculty development program could be a model for other educational institutions to mod-

ify their teaching techniques when teaching pharmacy students.

Roach (2014) implemented a partly-flipped class during a semester for microeconomics course and analyzed students' perceptions toward the flipped learning method. At the end of the course it was found that students had a positive impression of the flipped classroom.

Baepler et. al. (2014) applied the flipped classroom model to a chemistry class and investigated the effect of decreasing the time students spent seated inside a traditional amphitheater. The findings of the study showed that the learning outcomes achieved by students were at least as good as in the traditional classroom.

Butt (2014) studied a flipped classroom approach by inverting classroom materials with after–class materials for a final-year actuarial course. Student views for the structure of flipped classroom were obtained at the start and end of the semester. At the end of the study, it was found that there was a significantly positive change in student perceptions of the flipped classroom approach.

Love et al (2014) applied a flipped classroom model for a section of an applied linear algebra course and a traditional lecture format for another section of the course. End of semester survey and exams were organized for the examination of student content understanding and course perceptions. Sequential exams showed that students in the flipped classroom had more understanding of subject than students who were in the traditional lecture section. In addition, the results from the end of semester survey showed that flipped classroom students were quite positive regarding the course.

Gilboy et. al. (2015) implemented the flipped classroom model in two undergraduate nutrition courses and assessed the student perceptions regarding the model. The template allows faculty members to design activities that can take place before, during and after the class and also assessments taking into consideration Bloom's Taxonomy. It was found that the majority of the 142 students in the courses preferred the flipped method compared with the traditional classroom.

McLaughlin and Rhoney (2015) examined a flipped neurologic pharmacotherapy course's student performance, engagement and perceptions regarding an interactive online tool and compared the outcomes using the tool with the traditional downloadable paper handout. It was found that students who were using the online tool achieved considerably higher marks in their final exam.

Simpson and Richards (2015) used a flipped classroom approach to re-design a population health course for a nursing program. As a result, student reflections showed that students had a better understanding of the nursing curriculum content.

Hung (2015) investigated the effect of flipped classroom on academic achievement, learning attitudes and participation levels of English language learners. Three different formats of flipped teaching were applied and it was found that the structured and semistructured flipped lessons became more effective than the non-flipped lessons.

O'Flaherty and Phillips (2015) worked on a scoping review with the aim of providing a wide overview of studies which concern the emergence of the flipped classroom, the relationship among flipped classroom with pedagogy and educational outcomes and

consequently show information deficiency in academic literature. The study was carried out with the use of Arksey and O'Malley's five-stage framework. As a result, 28 articles carried out in 5 different countries were included in the scope of the review. The analysis of the articles revealed that there is considerable indirect evidence emerging that shows improved academic performance and student/staff satisfaction with the flipped approach. On the other hand, there is a lack of conclusive evidence concerning the contributions of the flipped classroom to the devel-

opment of lifelong learning and other 21st century skills in undergraduate and post-graduate education.

Looking at examples within the previous publications, it was found that the flipped classroom model had been applied to various educational disciplines with the aim of increasing interaction and personalized contact time between students and instructors in the classroom setting. As seen in the studies in literature although scoping review study was carried out, no studies were found on the trends in publications concerned with the flipped classroom concept.

Many proponents of hybrid courses say their main motivation is to improve the educational experience for students and to relieve limited resource pressures on college campuses, pointing to research that demonstrates that using blended learning improves student success rates in learning outcomes and retention [17] and that hybrid courses alleviate campus classroom shortages and enrollment pressures [12].

3 CASE STUDY ANALYSES

In order to capture the learners feedback and asses the impact within the research study used and devised a questionnaire.All the students have been taught using Google Classroom and within the course of Programming used the flipped learning methodology as a Case Study. All the teaching content was provided to them before hand and before the actuall classes. It was required to come prepared in classes. There were 54 participants that were included and filled in the questionnaire. The results are given below.

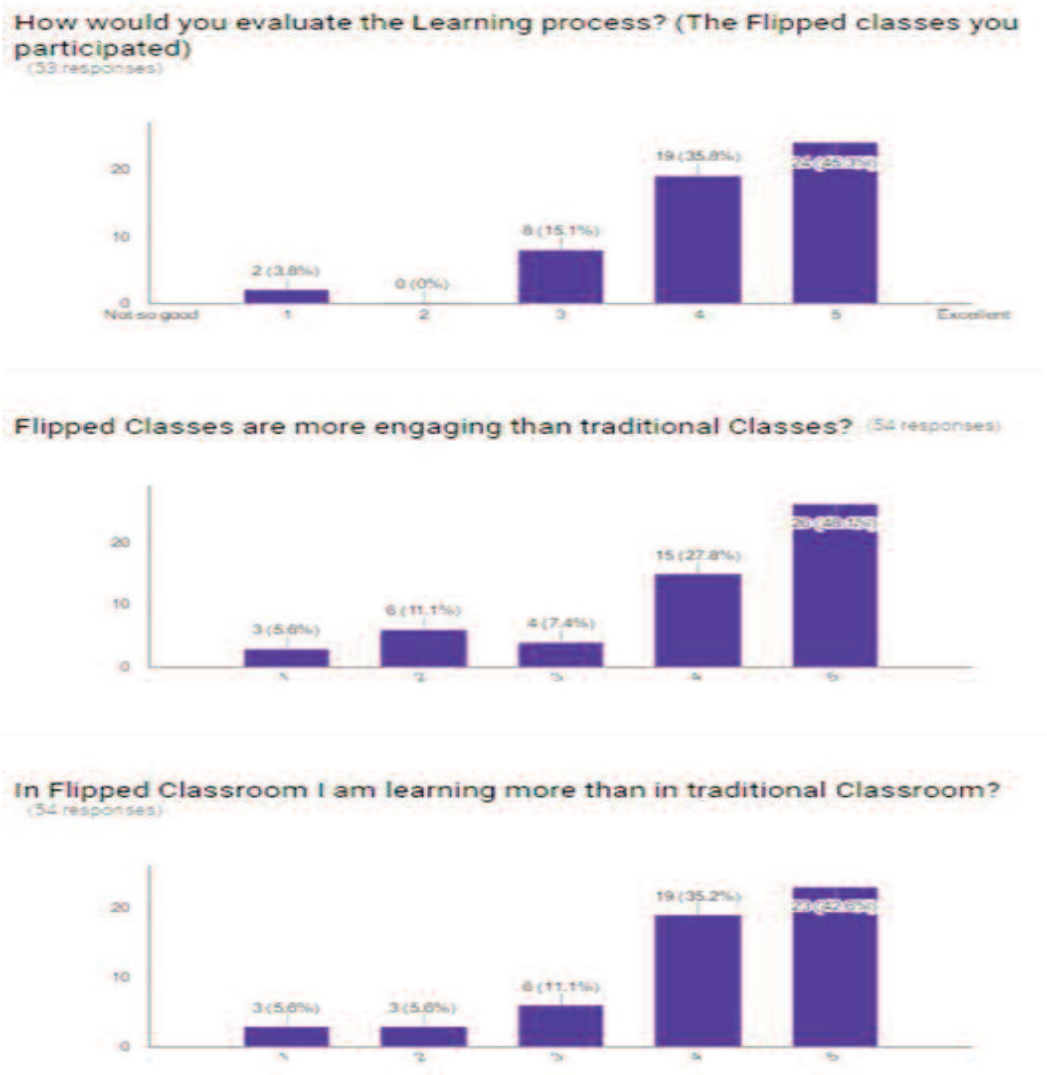
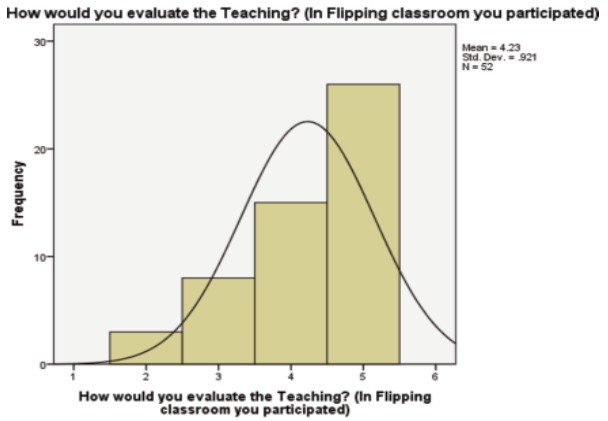


Fig 1. Results from assessing the methodology and approach undertaken



2. Histogram distribution of the data

4 CONCLUSIONS

The importance of this research study is that it may help educators to realize that teacher- student integration is possible to be improved in class time by class activities. Because, doing homework or class work in class time together provides a teacher with communication opportunities with their students [14]

Students sometimes learn from online video channels themselves. They follow the people who commonly titled as YouTubers who create and upload videos frequently [5]. For example, some YouTubers create a video series to instruct the programming languages chapters respectively. Students can subscribe the channel and get involved in the online video lessons. Taking benefits from this addiction, the Flipped learning may fill out the teacher-student gaps by online course materials and communications.

The issues identified where:

- To lecture the theory & practice in short class time, generally one class hour (45 min). In this regard curriculums are weak.
- Some students may not have the chance to use a robot at home. They may have smartphone or tablet simulators but using a real robot is a totally different experience.
- Students are more motivated when learning through robots.

With all the observations, interviews, analysis of my research data and my teaching experience I have found many tangible results. The most important one is the finding that the flipped learning pedagogy meets today's modern educational needs. Nowadays, technology is so widely used among people that educators need to keep up with it. Particularly students want to try new methods and they really like using technology in their education.

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THE LEVEL OF USE OF E-LEARNING IN UKZ FOR 2018

BASRI AHMEDI
University KadriZeka, Fakulty of Computer Sciences, Gjilan, Kosovo basri.ahmedi@uni-gjilan.net
XHEVDET THAQI
University KadriZeka, Fakulty of Computer Sciences, Gjilan, Kosovo xhevdet.thaqi@uni-gjilan.net
LINDITA NEBIU HYSENI
University KadriZeka, Fakulty of Computer Sciences, Gjilan, Kosovo lindita.nebiu@uni-gjilan.net
AFËRDITA IBRAHIMI
University KadriZeka, Fakulty of Computer Sciences, Gjilan, Kosovo aferdita.ibrahimi@uni-gjilan.net
SELAMI KLAIQI
University KadriZeka, Fakulty of Computer Sciences, Gjilan, Kosovo selami.klaiqi@uni-gjilan.net

ABSTRACT

At the Kadri Zeka University (KZU), the e-learning began to be used since the summer semester of the academic year 2015/2016 as a pilot project. The commission for accreditation in 2016, in the report would among others recommend that the usage ofe-Learning platform which was Moodle should be increased. In the year 2018, the Moodle 3.2 e-learning system was implemented at the university. Since then, using the Moodle 3.2 platform at the university, the following actions have been taken: the teacher manages his subjects; each course is divided into 15 weeks; every week the teacher decides the relevant material in accordance with the syllabus; the teacher can conceive where the students set up homework or project assignments; control and evaluation is carried out on time and with maximum transparency; the results of exams are announced by the teacher on the notice board from where the student is informed in real time; a forum can be used where debate can be opened on some issues; students who are members of the subject may receive materials that the professor has placed in various formats e.g. text, photo, video sequences; the student can enroll and unenroll in the relevant subjects by taking the key from the subject teacher. Moodle 3.2 also offers many other opportunities to improve the teaching and learning process but at this stage it is thought that this level of use is sufficient. Through the trainings, the positive aspects of e-Learning have been introduced and this has enabled a large number of teachers to perceive e-Learning not as a burden but as an efficient tool for the teaching process and teaching-student communication. Using Moodle more efficiently helps the teaching process in these areas: Efficient information, access to selected literature for each subject, transparency in the assessment process, teacher-student communication at all times. To prove this assumption, a research has been conducted at the University using a survey methodology. Thedata are collected fromstudents, professors, and assistantsthroughonline survey, then they are analyzed and interpretedthe significant results which supportsthe above assumptions.

1. INTRODUCTION

Nowadays the e-Governance experiences rapid growth in the world. All its fields such as e-Commerce, e-Business, e-Bank, e-Medicine, e-Learning, e-Voting etc. now are being differentiated as separate branches. The most important role in this direction is the application of ICT with basic

fields such as: programming, web technologies, database management systems, communication technologies, etc. This development can be measured by evaluating some indicators that describe the situation in the field. The level of eGovernment development in different countries in the world is different and is measured by the so-called e-Governance Development Index. Mathematically, the eGovernment Development Index is one-third of the sum of three-dimensional values in e-Governance and they are: the online services index (OSI), the Telecommunication Infrastructure Index (TII) and the human capital index (HCI) [3]. These indices are independently drawn for each country separately. The eGovernment Development Index for 2016 according to the United Nations Department of Economic and Social Affairs for some countries in the region is: Albania 0.5331, Macedonia 0.5885, Serbia 0.7131, Montenegro 0.6733 [3]. States develop different development strategies. Different countries in these strategies set different priorities and therefore the level of development and implementation of these areas is different. The degree of technological development in a region is important but is not always a dominant factor because the operating conditions of one of these areas such as e-Learning are easily achievable. Those conditions are: an operating system server that supports the computer network, Moodle platform [1] deployment, configuration, and training for use. From this, it is seen that not many investments are required, while the positive effects from use are multiple in the teaching process but also in the growth of the e-Government Development Index in that region [2 - 7]. With the conditions created, it seems that traditional teaching has to change, but this is a topic which nowadays concerns pedagogical sciences. These changes cannot happen quickly but in an evolutionary way and this is happening today without taking into account that there is some resistance to the implementation of e-Learning. Today there are several platforms that are being used in the teaching and learning process where most popular are: Moodle, BlackBoard, Googleclassroom. The Moodle platform for the first time began to be used in 2002 in Australia [8]. With a view to its continuous improvement there are over 30 versions to date [9]. This platform is free of charge. Today is used by many prestigious universities in Europe and the world such as Oxford University [10], Cambridge [11], ETH Zurich [12], EPFL Lausanne [13], University of Manchester [14], TechnischeUniversitat-Munchen [15] , University of Zagreb [16], University of Split [17] etc. Each of the actors participating in Moodle performs digital online actions. These actors are: Students, professors, administrators. Understandably, these actors are not like other citizens but have a solid level of education in using IT. The Moodle Platform is created in such a way that it is maintained not only by the administrator but also by all actors. Everyone does his job. This enables the system to serve everyone and to be largely maintained by the users themselves. It is worrying that no e-learning platform is currently being used in public universities in Albania and Kosovo. UKZ has been successfully using this platform since three years ago. At the beginning, as a test project and fromthe current year 2018, all professors and students are obliged to use it.

2. MATERIALS AND METHODS

In 2016, at the Kadri Zeka University (KZU) is implemented for the first time the Moodle platform for managing courses which are offered by faculties. Taking into account the user experience in this platform since the 2016, in 2018 is explored the level of use of e-Learing through questionnaires with closed-end questions [27] per professors, assistants and students of the KZU. In this study, is used the Survey Method [18] in order to analyze data through Cross-Sectional Surveys after collected data from representative sampling, which are 154 students, 16 professors and assistants. Data are collected using the Google Online

Survey [19]. Collected data are prepared into categorical data in order to analyze using SPSS tests as frequencies and cross tabs [20]. In this case is done the descriptive, comparative and association analysis. In the following are presented the results of this study.

3. RESULTS AND DISCUSSIONS

The Survey Method [18] is used in this study to address the research question "Which is the level of use of the e-Learning in the UKZ?". The interpretation of the significant results received from students, professors and assistants are shown in the following subsections.

A. The interpretation of the significant results received from students

The focus of the questionnaires per students was the level of usage of the e-Learning from the representing sample of the KZU students. The interpretation of the results of these questionnaires are shown in the following.

TABLE I. RESULTS OF STUDENT REGISTRATION IN E-LEARNING PLATFORM

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Registered	14	9.1	9.1	9.1
	Registered	140	90.9	90.9	100.0
	Total	154	100.0	100.0	

Based on the results presented in the Table I, 90.9% of 154 students are registered in the e-Learning platform while, 9.1 % are not registered.

TABLE II. RESULTS RELATED WITH HELP OF E-LEARNING IN THE STUDENTS` STUDIES

		Percent	Valid Percent	Cumulative Percent
Valid		.6	.6	.6
	Yes it helps to much, it is a powerfull tool	76.0	76.0	76.6
	I did not used	13.0	13.0	89.6
	No, it does not helped.	10.4	10.4	100.0
	Total	100.0	100.0	

From 154 students, 76% are declared that e-Learning is a powerfull tool that has helped them on their daily activity in the University. This result is shown in the Table II.

TABLE III. RESULTS RELATED WITH HELP OF E-LEARNING IN COMMUNICATION PROFESSOR-STUDENT

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No, it does not helps	30	19.5	19.5	19.5
	I did not used it	22	14.3	14.3	33.8
	Yes, it helps	102	66.2	66.2	100.0
	Total	154	100.0	100.0	

In the Table III, is shown that 66.2% of students are declared that e-Learning has helped the communication professor-student.

TABLE IV. RESULTS RELATED WITH E-LEARNING USAGE UNTIL THE END OF THE STUDY

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	20	13.0	13.0	13.0
	Yes	134	87.0	87.0	100.0
	Total	154	100.0	100.0	

Based on the questionnaires results in the table IV, the 87% of students want to use the e-Learning until the end of their study.

TABLE V. RESULTS RELATED WITH WITH KNOWLEDGE ABOUT OTHER ONLINE PLATFORMS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	48	31.2	31.2	31.2
	Yes	106	68.8	68.8	100.0
	Total	154	100.0	100.0	

From the results in the Table V, the 68.8% of students have knowledge per other platforms but they want to use e-Learning which is implemented in KZU.

The association between the students that are registered in e-Learning and students who want to use e-Learning until the end of their studies is analyzed and shown in the following Table VI.

TABLE VI. ASSOCIATION RESULTS RELATED WITH THE E-LEARNING USAGE -

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	12.159[a]	1	.000		
Continuity Correction[b]	9.425	1	.002		
Likelihood Ratio	8.786	1	.003		
Fisher's Exact Test				.003	.003
N of Valid Cases	154				

Based on presented results in the Table VIis found

that the registered students in the e-Learning want to use the e-Learning platform until the end of their study. This is significantly and statistically associatedconsidering the result of the Fisher`s Exact test [21-24], where p value is p=0.003.

Also, the association between the students who want to use e-Learning until the end of their studies and students who are declared that e-Learning helps in their studies is analyzed and shown in the following Table VII.

TABLE VII. ASSOCIATION RESULTS RELATED WITH THE E-LEARNING USAGEUNTIL THE END OF THE STUDY- 2

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	69.565[a]	3	.000
Likelihood Ratio	59.325	3	.000
N of Valid Cases	154		

In the table VII is found that the students who want to use e-Learning until the end of their studies are declared that e-Learning helps in their studies. This is significantly and statistically associated considering the result of theChi Square test, where p value is p=0.000.

Moreover, the association between the students who want to use e-Learning until the end of their studies and students who are declared that e-Learning help them in their communication with professor is analyzed and shown in the following Table VIII.

TABLE VIII. ASSOCIATION RESULTS RELATED WITH THE E-LEARNING USAGE UNTIL THE END OF THE STUDY - 3

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	39.288[a]	2	.000
Likelihood Ratio	39.789	2	.000
N of Valid Cases	154		

Based on findings, in the table VIII is shown that the students who want to use e-Learning until the end of their studies are declared that e-Learning helps in their communication with professor. This is significantly and statistically associated considering the result of the Chi Square test, where p value is p=0.000.

The last association between the students who are declared that e-Learning has help them in their study and the students who are declared thate-Learning help them in their communication with professor is analyzed and shown in the following Table IX.

TABLE IX. ASSOCIATION RESULTS RELATED WITH THE E-LEARNING USAGE UNTIL THE END OF THE STUDY - 4

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	125.066[a]	6	.000
Likelihood Ratio	91.398	6	.000
N of Valid Cases	154		

Based on findings, in the table IX is shown that the students who are declared that e-Learning has help them in their study is significantly and statistically associated with the students who are declared that e-Learning help them in their communication with professor. Considering the result of the Chi Square test in the Table IX, the p value of this association is p=0.000.

B. The interpretation of the significant results received from professors and assistants

Like the focus of the questionnaires per students, also the focus of the questionnaires per professors and students was the level of usage of the e-Learning from the representing sample of the KZU academic staff. The interpretation of the results of these questionnaires are shown in the following.

TABLE X. RESULTS OF STUDENT REGISTRATION IN E-LEARNING PLATFORM

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Registered	2	12.5	12.5	12.5
	Registered	14	87.5	87.5	100.0
	Total	16	100.0	100.0	

Based on the results presented in the Table X, 87.5% of 16 professors and assistants are registered in the e-Learning platform while, 12.5 % are not registered.

TABLE XI. RESULTS RELATED WITH HELP OF E-LEARNING IN WORK

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes it helps to much, it is a powerfull tool	11	68.8	68.8	68.8
	I did not used	5	31.3	31.3	100.0
	Total	16	100.0	100.0	

From 16professors and assistants, 68.8% are declared that e-Learning is a powerful tool that has helped them on their daily activity in the University. This result is shown in the Table XI.

TABLE XII. RESULTS RELATED WITH E-LEARNING USAGE CONTINOUSLY

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	16	100.0	100.0	100.0

Based on the questionnaires results in the table XII, the 100% of representing sample of professors and assistants want to use e-Learning continuously.

TABLE XIII. RESULTS RELATED WITH WITH KNOWLEDGE ABOUT OTHER ONLINE PLATFORMS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	2	12.5	12.5	12.5
	Yes	14	87.5	87.5	100.0
	Total	16	100.0	100.0	

From the results in the Table XIII, the 87.5% of representing sample of professors and assistants have knowledge per other platforms but they want to use e-Learning which is implemented in KZU.

C. Discussion of the significant results received from students, professors and assistants

Based on above results, the unexpected findings was that the students who have knowledge per other platform are not registered in the e-Learning but this was not associated with non-registration in the e-Learning.While, the expected finding which is consider as strength is that the e-Learning helps students in communication with professors and this impact the learning process [25].Another strength of e-Learning is that all registered professors and assistants in this platform want to use it continuously even if they have knowledge per other existing platforms [26].

4. CONCLUSION

The e-Learning platform is used at the Kadri Zeka University from students, professors and assistants since 2016. The outcomes of the level of usage of this platform in the 2018 is presented in this paper. Based on outcomes the registered students in the e-Learning want to continue using the platform until the end of their studies, even if they have the knowledge for the other platforms of this nature. Also, they confirms that the e-Learning have help them in the learning and in the communication with the professors and assistants and impact their learning.The level of usage of the e-Learning platform from the student is satisfactory because from the 154 representative sample of students 140 of them are registered in the e-Learning. Like students, also the registered professors and assistants in the e-Learning want to continue using the platform, even if they have the knowledge for the other platforms. The level of usage of the e-Learning platform from the academic staff is satisfactory because from the 16 representative sample of professors and assistants 14 of them are registers in the e-Learning.

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HIGH-RISK ACCORDING TO A RISK ASSESSMENT WORKPLACES RANKING

MONIKA LUTOVSKA
Faculty of Technical Sciences, University "Mother Teresa", Skopje, Republic of North Macedonia monika.lutovska@unt.edu.mk

VLADIMIR MIJAKOVSKI
Faculty of Technical Sciences, University "St. Kliment Ohridski", Bitola, Republic of North Macedonia vladimir.mijakovski@tfb.uklo.edu.mk

ZORAN TRIFUNOV
Faculty of Technical Sciences, University "Mother Teresa", Skopje, Republic of North Macedonia zoran.trifunov@unt.edu.mk

ALBINA MUÇA
Faculty of Technical Sciences, University "Mother Teresa", Skopje, Republic of North Macedonia albina.muca@unt.edu.mk

ABSTRACT: Providing a safe and healthy working environment nowadays is a cornerstone of work quality as a collective concern, equally prompted by humanitarian as well as economic considerations. In order to create a safer and healthier workplace, and in accordance with the Macedonian Law on Safety and Health at Work, every employer is obligated to conduct a risk assessment for every workplace. It involves a systematic recording, evaluation of risk factors that can cause injury, illness or occupational disease, and identifying possibilities to prevent, reduce, or completely eliminate the risks. A risk assessment for different workplaces in many companies in the Republic of Macedonia was conducted using a licensed software package for processing and analyzing data and risks were ranked in three categories: low, moderate and high risks. High risks were specially studied. Afterwards, the identified high-risk workplaces were ranked according to severity. For the first-ranked workplace- electrical installer of transmission lines, 35 out of a total 43 risks (or 78%) identified in the full risk assessment, were ranked as high risks. For the last-ranked workplace- a construction machine operator, 21%, or 9 out of 42 risks in total, are high risks. From the analysis, it can be concluded that the largest number of these high risks refer to injuries due to the workplace and work environment characteristics. The conclusions strongly suggest that special attention needs to be paid to the collective protective measures while performing terrain work, accompanied with the obligatory use of personal protective equipment (PPE).

KEYWORDS: high risk; workplace; risk assessment

1. INTRODUCTION

Today, the changing nature of the world, corporate structures, marketing strategies and modern production processes, pose more Occupational Safety and Health (OSH) issues, [1]. Taking into account the conservation of resources that from the standpoint of sustainability was typically thought of as an environmental, in the case of safety it must be considered by its humane dimension, [2]. A crucial factor in an individual's quality of life as well as in public health at the collective level is healthy workplace and working en-

vironment, [3]. However, OSH does not mean only protection of the employee from physical injuries and occupational diseases, so it must be considered as a multidisciplinary concept deeply concentrated on the promotion of safety, health and welfare of people engaged in work, [4]. Better sustainable concepts have to reach higher quality of safety and health at work for the employees in their workplaces and preventing injuries and deaths, which is actually the primary goal of every employer. In accordance with national laws and practices, [5], employers have an obligation to keep a list of occupational accidents resulting in a worker being unfit for work for more than three days and to prepare reports on occupational accidents suffered by their workers, [6]. Of particular importance for resolving the safety issues of a project is the investigation of potential hazards, their identification and elimination at the beginning of the planning phase, [7].

All analyzes made in recent decades show that the Republic of Macedonia has an unexpectedly high incidence rate of deaths, injuries and accidents at work, and the most hazardous occupational activities are: the work in the construction sector, households, transportation and storage, as well as manufacturing and agriculture, [8]. Accession Strategy towards EU imposes the need to accelerate the process of implementing the action OSH plans and improve the capacity of the State Labor Inspectorate and other state institutions in the field of health and safety, in order to ensure higher OSH management level, [9].

2. MATERIALS AND METHODS

2.1. Risk assessment

Following its candidacy to the EU, Republic of Macedonia adopted the Law on Safety and Health at Work in 2007, [5]. This Law, as a legal act of basic safety and health at work, completely takes over the provisions and fully corresponds with the terms of EU Framework Directive 89/391/EEC, [10].

Conducting a risk assessment is an obligatory duty of each employer, which means that every employer is obligated to identify the hazards and risk factors related to work or working conditions, eliminate or reduce them, and assess the effects of the remaining risks to the employees' health and safety, [11]. Risk assessment concept is based on the following principles:

- avoiding risks,
- assessing the remaining risk that cannot be avoided,
- elimination of the risk source through the implementation of modern technical solutions,
- adjustment of workplaces by selecting an appropriate technological process and avoiding the work monotony in order to reduce the negative effects on the employees' health,
- choosing of preventive measures and replacing the hazardous technological processes or methods with harmless or less dangerous,
- giving priority to collective over individual safety measures,
- conduct training for employees (general and specific for each workplace) and preparation of safe work guidelines.

As a basic step in a risk management process, risk assessment must be conducted for every workplace. Due to the demand of a systematic and continuous evaluation, all phases of risk assessment (planning, hazard identification, defining of risk, assessing risks, proposing preventive measures, communication and follow-up the feedback) are equally important, [11]. In addition, some important data needed for conducting of assessment are listed:

- the description and characteristics of the work activities,
- the number, gender, age and level of education of each employee exposed to the risks at its respective workplace,
- organization of work in shifts,

- the number and the nature of possible injuries that had previously occurred at the workplace
- specific working conditions

The risk assessment activities in this paper were carried out by an authorized institution, using a licensed software package LatiPRO, [12] for recording, processing and analyzing data in the field of OSH, [13].

For estimating the risk values the following formula is used, [14]:

$$RISK = TP \times ZI \times VP \times BL$$

where:

TP - severity of potential injury, obtained on a seven-point scale ranging from 1 (scratches) to 7 (fatal injuries)

ZI - frequency of exposure to dangers, obtained on a six-point scale ranging from 1 (once a year) to 6 (continuously)

VP - probability of injury, obtained on an eight-point scale ranging from 1 (almost impossible to happen, only under exceptional circumstances) to 8 (sure to happen, there is no doubt)

BL - number of exposed people, obtained on a five-point scale ranging from 1 (1÷2) to 5 (50 and more).

The total value of the estimated risk is obtained as a product of the values of previously defined parameters, and it is categorized according to the values shown in the Table 1, [15]:

Table 1. *Risk category of estimated risk*

Risk category RISK = TP × ZI × VP × BL				
Negligible Risk	Low Risk	Moderate Risk	High Risk	Unacceptable Risk
0÷5	6÷50	51÷250	251÷500	> 500

Operating in a case where the risk is higher than 500 are unacceptable and work in such conditions should be stopped immediately.

3. RESULTS AND DISCUSSION

According to the National classification of activities in the Republic of Macedonia, 'Public administration, Police and Defense', 'Households as employers by their own needs and agriculture activities' and 'the Construction sector' are counted as the most risky occupational sectors in the period 2010 to 2016, [16,17].

The analyzes from risk assessments for different workplaces in many small and medium companies in Macedonia, were used in this paper. Risks were ranked in three categories: low, moderate and high risks. High risks were specially studied. Afterwards, the identified high-risk workplaces were ranked according to severity (Table 2):

Table 2. *Risk assessment workplaces ranking*

Medical worker						
Total risk	Negligible risk	Low risk	Moderate risk	High risk	Unacceptable risk	**Max risk**
40	0	15	11	14	0	**400.00**
Construction worker at a mobile site						
Total risk	Negligible risk	Low risk	Moderate risk	High risk	Unacceptable risk	**Max risk**
63	0	9	29	25	0	**400.00**
Construction machine operator						
Total risk	Negligible risk	Low risk	Moderate risk	High risk	Unacceptable risk	**Max risk**
42	0	19	14	9	0	**400.00**
Chemical laboratory worker						
Total risk	Negligible risk	Low risk	Moderate risk	High risk	Unacceptable risk	**Max risk**
34	0	18	8	8	0	**400.00**
Crusher worker in a quarry						
Total risk	Negligible risk	Low risk	Moderate risk	High risk	Unacceptable risk	**Max risk**
22	0	8	9	5	0	**400.00**
Blasting worker						
Total risk	Negligible risk	Low risk	Moderate risk	High risk	Unacceptable risk	**Max risk**
21	0	7	6	7	0	**400.00**
TNG station operator						
Total risk	Negligible risk	Low risk	Moderate risk	High risk	Unacceptable risk	**Max risk**
41	0	13	12	16	0	**400.00**
Hoist operator						
Total risk	Negligible risk	Low risk	Moderate risk	High risk	Unacceptable risk	**Max risk**
27	0	8	8	11	0	**400.00**
Operator in the substation						
Total risk	Negligible risk	Low risk	Moderate risk	High risk	Unacceptable risk	**Max risk**
38	0	4	5	29	0	**400.00**
Electrical installer of transmission lines						
Total risk	Negligible risk	Low risk	Moderate risk	High risk	Unacceptable risk	**Max risk**
43	0	3	5	35	0	**400.00**

In particular the share of high risks into the total number of risks for every workplace was examined separately, (Table 3):

Table 3. *High risk workplaces ranking*

Workplace	**Total number of risks**	**High risk**	**Share of the high risks in the total number of risks**
Electrical installer of transmission lines	43	35	78%
Operator in the substation	38	29	76%
Hoist operator	27	11	41%
Construction worker on a mobile site	63	25	40%
TNG station operator	41	16	39%
Medical worker	40	14	35%
Blasting worker	21	7	33%
Chemical laboratory worker	34	8	24%
Crusher worker in a quarry	22	5	23%
Construction machine operator	42	9	21%

For the first-ranked workplace - electrical in-

staller of transmission lines, 35 out of a total 43 risks (or 78%) identified in the full risk assessment, were ranked as high risks. For the last-ranked workplace - a construction machine operator, 21%, or 9 out of 42 risks in total, are high risks (Figure 1):

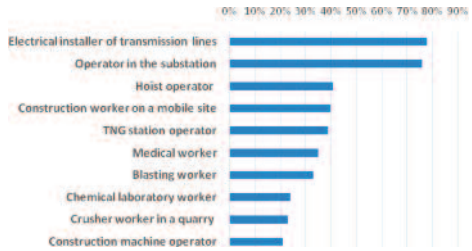

Fig.1 Share of the high risks in the total number of risks

Classification of determined hazards from the risk assessment comes down to several groups:

- Mechanical hazards due to use of work equipment (free movement of parts or materials that may cause injury to the employee)
- Hazards related to workplace and work environment characteristics - slipping, stumbling, losing balance, falling
- Hazards from electricity supply installations
- Harmfulness that occur during the working process (chemical, physical, biological)
- Damages from physical and psychophysiological efforts
- Other hazards associated with the work organization

From the analysis, it can be concluded that the largest number of these high risks refer to injuries due to the workplace and work environment characteristics.

The nature of terrain work, like work at a height, in depth, scaffolding, suspended platform work, excavation work, demolition, working with electrical or pressure installations, gives an especially large number of high risks.

4. CONCLUSIONS

Risk assessment practice is based on the fundamental Occupational Safety and Health Act which lays down general principles concerning the prevention and protection of workers against occupational accidents and diseases at work [10].

The identified high risks related to work or working conditions primarily occurred due to both insufficient individual and collective employee's protection during terrain work.

From the analyzed data it is clearly evident that the high risk share can reach up to 78% of the total number of risks at critical workplaces. These risks must be prevented, reduced to an acceptible level or, if it is possible, completely removed. The effects of the remaining risks to the employees' health and safety have to be assessed, [18]. Reducing risks during critical activity provide an added measure of protection and strengthen our existing safety and health environment management system, [19]. The conclusions strongly suggest that special attention needs to be paid to the collective protective measures while performing terrain work, accompanied with the obligatory use of personal protective equipment (PPE). This will lead to benefit from minimizing occupational diseases and healthcare costs, sickness absence, as well as improving working conditions, [19].

According to separate methodological proposals disclosed in scientific literature, [20], the assessment tools provide companies not only to comply with the law, but also to contribute to a database for monitoring and assessing, as well as to give an access to data analysis and comparisons. In order to create a rational budget and set realistic goals without compromising safety, creating of more jobs and better quality of work conditions has become one of the main objectives of social policies for every government [3].

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DETERMINATION OF CORPORATE CREDIT RATING OF THE COMPANIES IN THE REPUBLIC OF MACEDONIA AS A TOOL FOR THE CREDITWORTHINESS OF THE COMPANIES

VALBONA AJDARI
valbona.ajdari@outlook.com

ISEIN AJDARI
JSC Macedonian Power Plants – Skopje, Subsidiary TPP "OSLOMEJ"- Kicevo isen.ajdari@yahoo.com

ABSTRACT:In this paper, the primary task is to show how important the credit rating is for decision-making for companies when concluding contracts for mutual cooperation between companies, and avoiding any financial risks. In this paper, among other things, through a case study is performed analysis of twenty five randomly selected companies from the Republic of Macedonia, and for the same several key financial indicators are calculated in order to reach the creditworthiness of the selected companies. As the main objective of this paper is after obtaining a clear picture of the credit rating of the companies from the calculated and analyzed results of the financial analysis, to be able to determine the financial power of a given company and their ranking according to the creditworthiness of the company. The paper aims to warn companies also in the Republic of Macedonia on the importance of the credit rating as a tool for the creditworthiness of companies when making smart decisions before concluding business contracts in order to avoid possible unintended consequences and financial risks. In the preparation of the paper, are used standard methods of secondary research for which through data sources were collected information on the characteristics, the notion as well as the elements and structure of the credit rating as a model for business decision-making and the adoption of smart decisions by the companies in the Republic of Macedonia.

KEYWORDS:credit rating, credit rating companies, financial indicators, creditworthiness, net worth.

1 INTRODUCTION

The process of globalization has led companies to do business not only locally, with well-known and validated partners, but to provide offers of cooperation from different parts of the world. Unknown business partners who show a high interest in cooperation, could be a good opportunity for business, but at the same time could be with high risk. In the modern business environment the information travel fast, major business decisions are made daily, and the risk with each decision is growing. Therefore, the tool for the creditworthiness of companies reduces the risk and helps for making the right business decisions.

The credit rating is considered as an opportunity for creating a good investment climate and an indicator that every serious investor checks before making a decision to invest in a given company.

This paper is divided into three chapters as follows:

In the first chapter, "Characteristics of Credit Rating and Credit Rating Agencies", is shownthe concept of the credit rating from a theoretical point of view, as a tool for the creditworthiness of companies.

In the second chapter, "Financial reports and analytical indicators for analyzing the performance of companies" is done a review of the practical application of financial statements in the analyzing of the companies performance.

In the third chapter, "Case Study: Empirical Analysis of Useful Financial Indicators for Companies in the Republic of Macedonia", a specific research was done through a case study, which analyzes the key financial indicators of Macedonian companies. By using the theoretical background from the first and second part of the paper, was made an attempt to analyze the performances of the selected companies from the Macedonian economy, and base for this analysis are the published audited financial statements of the selected companies.

Within the financial analysis, subject of research are several key financial indicators as well as the operating profit - EBIT, net-worth and working capital of the companies.

Chapter -I- Characteristics of credit rating and credit rating agencies

2. Meaning and characteristics of credit ratings and credit rating agencies

Credit rating represents an opinion given by a specialized agency for the creditworthiness of the issuer.A credit rating is an opinion issued by a specialised firm on the creditworthiness of an entity (e.g. an issuer of bonds) or a debt instrument (e.g. bonds or asset-backed securities). This opinion is based on research activity and presented according to a ranking system.

The credit rating is prepared by the Credit Rating Agency (CRA). Each agency uses unique grades based on letter to indicate whether the debt has a low or high standard risk and the financial stability of the publisher.

A credit rating assesses the credit worthiness of an individual, corporation, or even a country. Credit ratings are calculated from financial history and current assets and liabilities. Typically, a credit rating tells a lender or investor the probability of the subject being able to pay back a loan.A poor credit rating indicates a high risk of defaulting on a loan, and thus leads to high interest rates or the refusal of a loan by the creditor.

2.1 Credit rating users

Users of the service offered by a rating agency can be classified by the type of investments evaluated, with two main categories: financial investors and financial intermediaries. The classification is useful due not only to the different purposes but also the different regulatory constraints applied to the two types of users.

Principal users of CRA ratings include :

- Issuers. Issuers value credit ratings because they lower the costs issuers pay for capital. Credit ratings reassure investors both about the risks they face when making an investment and by serving to reassure them about the competence and responsibility of management.

- Investors in Fixed-Income Securities. Investors frequently use credit ratings when assessing whether to purchase a given debt security. If investors respect the opinions of a particular CRA, investors may rely on a given rating as an estimate of the risk a particular investment presents. Credit ratings in such situations act as a proxy for or a check against investors' own research and analysis of the risks related to a particular debt security.

- Institutional Investors. Institutional investors and other buy-side firms such as collective investment schemes, pension funds and insurance companies tend to be among the largest purchasers of fixed-income securities in many jurisdictions and, in many jurisdictions, investors in fixed-income securities are almost exclusively institutions, they also frequently rely on CRAs to support or refute their own assessments and also to comply with internal investment restrictions or policies that require the firm to maintain certain minimum credit ratings for investments, or to identify acceptable counterparties and to construct bond indices against which they monitor the performance of fund managers or index mutual funds.

- Equity Investors. Although CRAs are not equity analysts and credit ratings are not substitutes for equity research, equity investors as well may use

credit ratings as one of many factors when deciding whether to purchase a company's equity securities.

- Broker-Dealers and Sell-Side Firms. Many brokerage companies and other sell-side firms (i.e., investment firms that make recommendations and sell securities to clients) engage in their own credit analysis for risk management and trading purposes. As with institutional investors, broker-dealers and investment advisors may use CRA ratings as a check against their own research and recommendations

- Regulators. Financial regulators in many jurisdictions increasingly appear to use credit ratings for a variety of purposes. These uses vary from setting capital requirements for banks and other financial institutions to rules governing money markets funds, pension funds and collective investment schemes, and in regulating asset-backed securities.

- Use by Private Parties. Creditors and other businesses may use CRA ratings in private contracts for a variety of purposes.

2.2 Credit rating agencies

CRAs assess credit risk of borrowers (governments, financial, and non-financial firms). A credit rating can be defined as 'an opinion regarding the creditworthiness of an entity, a debtor financial obligation, debt security, preferred share or other financial instrument, or of anissuer of such a debt or financial obligation, debt security, preferred share or other financialinstrument, issued using an established and defined ranking system of rating categories'. Arating only refers to the credit risk; other risks, like market risk (the risk due to unfavourablemovements in market prices) or liquidity risk (the risk that a given security or asset cannot betraded quickly enough in the market to prevent a loss) are not covered.

A credit rating agency (CRA) is a service provider specialised in the provision of credit ratings on a professional basis. The three biggest rating agencies are Moody's Investor Services (Moody's), Standard & Poor's (S & P) andFitch Ratings (Fitch).There are around 150 CRAs, but the three largest competitors cover approximately 95% of the rating business. Smaller rating agencies make up the remaining part. Standard & Poor's Ratings Services and Moody's Investors Service have 40 percentof the market while Fitch Ratings holds 15 percent.

Table 1.1 provides a tabular overview of the three major credit rating agencies - Fitch, Moody's and Standard & Poor's (S & P).

Table 1.1 Rating Agency Statements on What Their Ratings Are Designed to Measure

Fitch	"Credit ratings express risk in relative rank order, which is to say they are ordinal measures of credit riskand are not predictive of a specific frequency of default or loss. Fitch Ratings' credit ratings do not directlyaddress any risk other than credit risk, ratings do not deal with the risk of a market value loss on a ratedsecurity due to changes in interest rates, liquidity and other market considerations."
Moody's	"There is an expectation that ratings will, on average, relate to subsequent default frequency, althoughthey typically are not defined as precise default rate estimates. Moody's ratings are therefore intended toconvey opinions of the relative creditworthiness of issuers and obligations...Moody's ratings process alsoinvolves forming views about the likelihood of plausible scenarios, or outcomes—not forecasting them, butinstead placing some weight on their likely occurrence and on the potential credit consequences. Normalfluctuations in economic activity are generally included in these scenarios, and by incorporating our viewsabout the likelihood of such scenarios, we give our ratings relative stability over economic cycles and asense of horizon."
Standard & Poor's	"Standard & Poor's credit ratings are designed primarily to provide relative rankings among issuers andobligations of overall creditworthiness; the ratings are not measures of absolute default probability. Creditworthiness encompasses likelihood of default and also includes payment priority, recovery, andcredit stability."

Source: IMF (2010).

Credit ratings are expressed on a scale of letters and figures. The Standard & Poor's rating scale is, for example, as follows: AAA (highest rating), AA, A, BBB, BB, B, CCC, CC, C, D (lowest rating), (see Table 1.2). Modifiers are attached to further distinguish ratings within classification. Whereas Fitch and Standard & Poor's use pluses and minuses, Moody's uses numbers.

Table 1.2 Credit rating and interpretation

Interpretation	Fitch and S&P	Moody's
Highest quality	AAA	Aaa
High quality	AA+	Aa1
	AA	Aa2
	AA-	Aa3
Strong payment capacity	A+	A1
	A	A2
	A-	A3
Adequate payment capacity	BBB+	Baa1
	BBB	Baa2
	BBB-	Baa3
Likely to fulfill obligations, ongoing uncertainty	BB+	Ba1
	BB	Ba2
	BB-	Ba3
Obligations with high risk	B+	B1
	B	B2
	B-	B3
Default	CCC+	Caa1
	CCC	Caa2
	CCC-	Caa3
Near bankruptcy or default	CC	Ca
	C	C
	D	D

Source: IMF (2010).

Ratings play a crucial role in financial markets as investors use them to evaluate the credit risk of financial instruments. The assessment of these instruments requires specific knowledge and is highly time-consuming, making it attractive for individual investors to rely on the rating of the CRAs. The ratings have an important influence on the interest rate that borrowers have to pay. A downgrading may lead to a higher interest rate on loans. Portfolio manager performance is often benchmarked against standard indices that are usually constructed on the basis of credit ratings. This implies that a downgrade to below the investment-grade threshold often triggers immediate liquidation, leading to herd behaviour. This kind of behaviour may increase market volatility and may even cause a self sustaining downward spiral of asset prices with potential negative effects for financial stability.

2.3 Reference setting for research

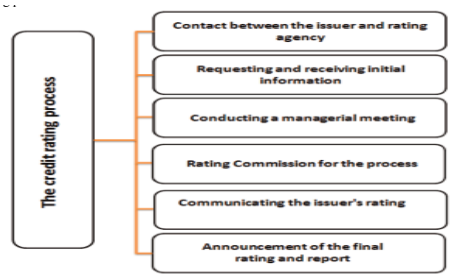
Below we will give an explanation for the process of the process and methodology of the credit rating.

A credit rating is initiated when an entity wishes to assess its credit worthiness. The entity is typically referred to as the obligor or issuer and will seek a rating for the entity or issuance of debt. The decision to initiate or maintain an existing rating depends on the availability of information. The rating agency has to determine whether the information provided is sufficient to reach a view of the creditworthiness of the obligor or issuer. If the rating agency deems the information insufficient to form an opinion on creditworthiness, no rating will be assigned or maintained.

Once contact has been established between an issuer/obligor and the rating agency, the primary analyst will send the information request to the issuer/obligor. At the start of the rating process, each rated entity or transaction is assigned to a primary analyst, who works with the support of a secondary analyst. For corporate and public finance ratings, the primary analyst is responsible for leading the analysis and formulating a rating recommendation and is typically also responsible for the continuous surveillance of the rating during the life of its publication. The primary and secondary analysts assigned to carry out the analysis have ground presence and have in-depth knowledge of the local background to the industry and economy.

In Figure 1.1, is shown a block diagram showing the process of the credit rating process.

Figure 1.1 The credit rating process



Source:

http://www.dailymirror.lk/108569/Credit-rating-Process-and-methodologies#sthash.CWVQOC8d.dpuf).

2.3.1 Dun and Bradstreet credit rating and rating-process

The Dun & Bradstreet Corporation (DNB) is a company that provides commercial data, analytics, and insights for businesses. At the heart of the information contained in a Business Information Report is the D&B Rating.

Table 1.3Company ranking according to Dun and Bradstreet

Based on Net Worth		Based on Issued Capital Figure	
5A	Financial Strength of 60 + million	5AA	Financial Strength of 60 + million
4A	Financial Strength of 25 - 60 million	4AA	Financial Strength of 25 - 60 million
3A	Financial Strength of 12 - 25 million	3AA	Financial Strength of 12 - 25 million
2A	Financial Strength of 2.5 - 12 million	2AA	Financial Strength of 2.5 - 12 million
1A	Financial Strength of 1.2 - 2.5 million	1AA	Financial Strength of 1.2 - 2.5 million
A	Financial Strength of 600,000 - 1.2 million	AA	Financial Strength of 600,000 - 1.2 million
B	Financial Strength of 345,000 - 600,000	BB	Financial Strength of 345,000 - 600,000
C	Financial Strength of 175,000 - 345,000	CC	Financial Strength of 175,000 - 345,000
D	Financial Strength of 120,000 - 175,000	DD	Financial Strength of 120,000 - 175,000
E	Financial Strength of 60,000 - 120,000	EE	Financial Strength of 60,000 - 120,000
F	Financial Strength of 35,000 - 60,000	FF	Financial Strength of 35,000 - 60,000
G	Financial Strength of 15,000 - 35,000	GG	Financial Strength of 15,000 - 35,000
H	Financial Strength of 0 - 15,000	HH	Financial Strength of 0 - 15,000

Source: https://dbemc.dnb.com/dnb-rating.

Other codes used:

- N - Financial Strength is negative
- O - Financial Strength is undisclosed
- NB - New Business less than 18months old
- NQ - Ceased Trading

Example: D & B Rating 5A 4

The Dun and Bradstreet Rating consists of two parts :

(a) Financial Strength Indicator (shown in the example as 5A)

(b) Risk Indicator (shown in the example as 4)

The Financial Strength Indicator is calculated using either the Net Worth or Issued Capital of the Subject Company. If both figures are available, then the Net Worth is always used to calculate the Financial Strength.

Table 1.4 Risk indicators and their interpretation according to D & B

Risk Indicator	Probability of failure	Guide to interpretation
1	Minimal risk	Proceed with transaction - offer terms required
2	Low risk	Proceed with transaction
3	Greater than average risk	Proceed with transaction but monitor closely
4	Significant level of risk	Take suitable assurances before extending credit
5	Insufficient information to assign a risk indicator	No public information or D&B proprietary information available to indicate trading activity

Source: https://dbemc.dnb.com/dnb-rating.

Thus, the example rating shows a Company with a Financial Strength of 60 + million (probably based on Net Worth), in a poor condition with a significant level of risk. The supplier is recommended to get significant guarantees before granting credit.

Chapter -II- Financial reports and analytical indicators for the analysis of the operations of the companies

3. Application of the financial statements in the analysis of the operations of the companies

3.1 Financial statements (term, content and valuation)

The financial statements are the basis for assessing the credit rating of a company. In the process of financial / economic analysis, various formal and informal data are reviewed and tested to reveal the significant links between separate items of financial statements and their connection to the financial goals of the company.

In the process of analysis of the financial statements commonly are used the information contained in: Balance sheet, Income statement, Cash flow statement, Statement of changes in equity and Explanatory notes and accounting policies.

3.2 Analytical indicators of the financial condition of the business entity

Financial analysis is an ancillary "tool" of the financial management, which includes evaluating of the financial position and operating performance of the company, the industry, even the overall economy, as well as predicting the future state and performance.

Ratio (rate, indicator) represents a mathemati-

cal relationship between two sizes , and the rational analysis method is based on the ratios that express the relation of two or more balance positions. There are as many different financial indicators as there are and possible combinations of items that appear in the balance sheet, the income statement and the cash flow statement, and in this paper, within the framework of the financial analysis, the subject of the research are the following ratios:

(Current Ratio (X) =current assets/current liabilities) (1)

(Solvency Ratio (%) = (total liabilities (or total asstets) / Net worth)*100) (2)

(Fixed Assets to Net Worth (%)=(Fixed Assets current year/Net Worth current year)*100)(3)

(Current Liabilities/Net Worth (%) (current liabilities / Net worth)*100)(4)

(Asset Turnover (%) (net sales / average of total assets for last 2 years)*100) (5)

(Sales / Net Working Capital (X) (net sales / average of total assets for last 2 years)*100) (6)

(Assets / Sales (%)(average of total assets for last 2 years / net income from sales)*100)(7)

(Profit Margin(%)(total profit or loss / net sales)*100)(8)

(Shareholders Return (%)(total profit or loss / average of net worth for last 2 years)*100)(9)

(Return On Assets (%)total profit or loss / average total assets for the last 2 years)*100)(10)

(Debt Ratio(Total liabilities/ Total assets))(11)

Chapter -III- Case Study

4. Case Study: Empirical analysis of useful financial indicators of companies in the Republic of Macedonia.

4.1 Selection of a representative sample of companies from the Macedonian economy

This part of the paper is intended for illustrative analysis of the performance of the 25 selected companies from the Macedonian market, By analyzing their financial statements for 2016through the use of financial indicators.

Table 3.1 Shows selected companies and their basic data

In this part of the paper, as part of the financial analysis, the subject of the research are several key financial indicators that are explained in the second chapter calculated and presented in the following table and diagrams.

Table 3.2 presents the key financial indicators.

Table 3.2 shows the results of the labor from the calculated financial indicators for the selected companies, calculated according to the formulas (1) to (11) which are explained in detail in the subheading 2.2.

As we can see from the table:

-The company with the highest Current Ratio (X) is PRILEPSKA PIVARNICA JSCwhose value of the indicator amounts 7,37.

-The company with the lowest Solvency Ratio (%) is PRILEPSKA PIVARNICA JSCwhose value of the indicator amounts 110,94%.

-The company with the lowestvalueof the debt ratio is PRILEPSKA PIVARNICA JSCwhose value of the indicator amountso,10.

-The company with the lowest valueof the Current Liabilities/Net Worth ratio (%)compared to other companies isPRILEPSKA PIVARNICA A.D whose value of the indicator amounts10,80 .

-The company with the highest value ofAsset Turnover (%) ratio is OKTA JSCwhose value of the indicator amounts285,24% .

-The company with the highest value of the ratio Sales / Net Working Capital (X) is FZC 11 OKTOMVRI JSCwhose value of the indicator amounts44,54.

-The company with the highest value ofProfit Margin (%) ratio is CEMENTARNICA USJE JSCwhose value of the indicator amounts33,11% .

-The company with the highest value ofthe Shareholders Return (%) isCEMENTARNICA USJE JSCwhose value of the indicator amounts35,73%.

-The company with the highest value of the Return On Assets (%) ratio isCEMENTARNICA USJE JSCwhose value of the indicator amounts

Table 3.1 Selected companies and their basic data

	Company name	ID number	Tax number	Employees
1.	ADING A.D.	4205880	4030989151658	125
2.	ARCELORMITTAL SKOPJE (CRM) A.D.	5166187	4030997270720	445
3.	ARCELORMITTAL SKOPJE (HRM) AD	5166217	4030997270747	1
4.	AUTOMAKEDONIJA A.D. SKOPJE	4058097	4030947262832	203
5.	BETON-SHTIP A.D.	5079896	4029995101745	424
6.	BLAGOJ GJOREV A.D.	4055306	4004996104125	162
7.	VABTEK MZT A.D.	4137787	4030990181404	324
8.	VETEKS A.D. VELES	4231660	4004991106200	163
9.	EVROPA A.D. C.O. SKOPJE	4054016	4030954262848	400
10.	MAKEDONSKI TELEKOM A.D.	5168660	4030997339640	1162
11.	MERMEREN KOMBINAT A.D.	4058615	4021978120000	383
12.	MZT PUMPI A.D.	4137906	4030990120960	98
13.	OKTA AD - SKOPJE	4074009	4030980254845	420
14.	PEKABESKO A.D.	4059867	4030991112554	428
15.	PELISTERKA AD Skopje	4010876	4002989121429	175
16.	PRILEPSKA PIVARNICA A.D.	4071344	4021991109104	255
17.	RADE KONCHAR-APARATNA TEHNIKA A.D.	4053222	4030977259488	200
18.	RIK SILEKS A.D. Kratovo	4031431	4014955100676	409
19.	SLAVEJ A.D. SKOPJE	4060326	4030995109825	70
20.	TAJMISHTE A.D. KICEVO	4401492	4012992100942	150
21.	FABRIKA KARPOSH A.D.	4054890	4030948263700	380
22.	FAKOM A.D.	4095596	4030982260338	631
23.	FZC 11 OKTOMVRI A.D.	4028201	4017991106167	683
24.	FRUKTAL MAK A.D.	4808240	4030994229312	54
25.	CEMENTARNICA USJE A.D.	4053397	4030954259677	284

Source: adapted according to data published by the Public Revenue Office and Audited Financial Statements of companies published by Macedo Exchange AD Skopje.

31,54.

-The company with the largest working capital is OKTA JSCwhose working capital for 2016 amounts 2.141.259.000 denars.

Picture 3.1 shows a company's EBIT diagram, EBIT (Earnings Before Interest & Tax) –which is a result of the regular operation of the company, for twenty-five companies taken as a representative sample in the paper.

Picture 3.1 Company's EBIT diagram

From the diagram 3.1, it can be seen that CEMENTARNICA USJE JSC, MACEDONIAN TELEKOM JSC and OKTA JSC fall into the group of companies with the highest EBIT. The diagram shows three companies whose EBIT is below zero.

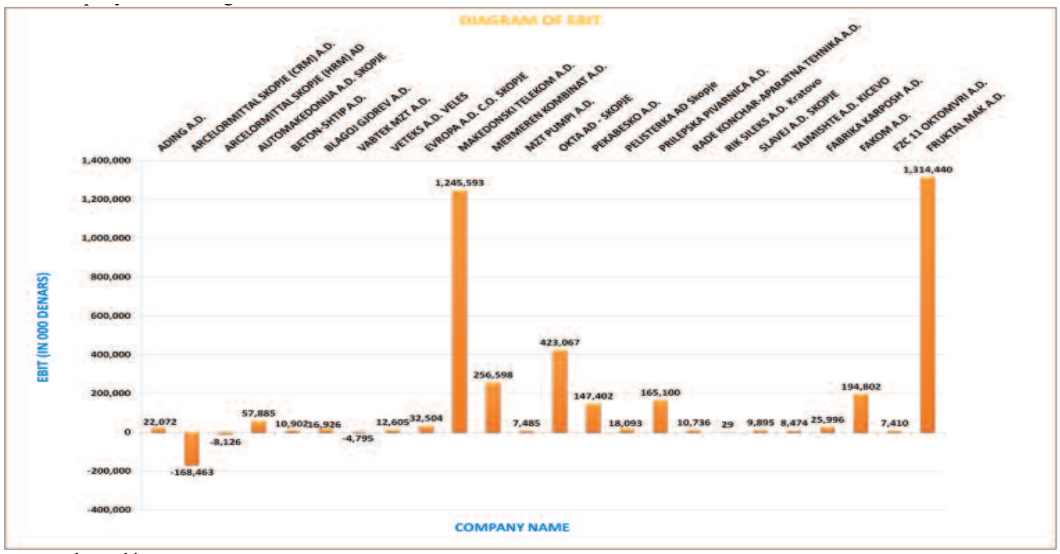
Picture 3.2 shows the diagram of net worth of all taken as a representative sample in the paper.

From the diagram3.2, itself it can be seen that MACEDONIAN TELECOM JSC, OKTA JSC and CEMENTARNICA USJE JSC fall into the group of companies with the highest net worth. The dia-

Table 3.2 Key financial indicators

Number of company	Current ratio (x)	Solvency Ratio (%)	Debt Ratio (x)	Fixed Assets/Net Worth (%)	Current Liabilities/Net	Asset Turnover (%)	Sales / Net working Capital (x)	Assets/Sales	Profit Margin (%)	Shareholders Return	Return on Assets
1	2,20	161,91	0,38	67,08	36,08	79,70	2,62	125,47	3,10	4,00	2,47
2	0,53	-504,54	1,19	-186,30	-604,54	213,03	-3,62	46,94	-2,88	36,68	-6,13
3	0,00	-0,67	149,58	-0,30	-100,67	0,91	0,00	10938,16	-86310,53	4,86	-789,08
4	2,14	150,33	0,31	90,23	28,06	105,45	4,72	94,83	10,40	17,69	10,97
5	0,72	1265,04	0,76	156,65	952,08	75,23	-9,22	132,93	2,98	11,67	2,24
6	1,14	182,00	0,45	92,17	55,15	75,68	16,73	132,13	0,09	0,12	0,07
7	0,98	-201,35	1,49	-55,93	-147,62	95,27	-439,50	104,96	-7,36	14,66	-7,01
8	2,47	155,74	0,36	33,11	48,28	97,31	2,26	102,76	5,05	7,72	4,92
9	1,96	128,44	0,22	48,57	24,69	75,26	3,81	132,87	4,06	4,02	3,06
10	1,08	138,46	0,25	97,09	35,46	57,29	24,43	174,56	11,59	9,32	6,64
11	5,65	131,07	0,22	51,38	14,10	74,84	1,84	133,62	23,72	23,58	17,75
12	0,92	143,71	0,27	112,56	33,77	53,88	9,80	185,59	0,28	0,24	0,15
13	2,02	147,86	0,32	51,60	47,53	285,24	9,57	35,06	1,97	8,71	5,61
14	1,35	216,43	0,54	118,75	71,42	210,46	16,90	47,51	2,92	13,97	6,14
15	1,27	193,66	0,48	71,20	76,69	57,02	5,62	175,39	1,42	1,62	0,81
16	7,37	110,94	0,10	31,22	10,80	82,79	1,36	120,79	9,97	9,22	8,26
17	3,10	116,88	0,14	44,86	11,30	40,12	2,06	249,23	10,34	4,93	4,15
18	0,71	152,39	0,34	111,92	52,39	33,58	-1,81	297,79	-1,20	-0,71	-0,40
19	2,11	163,99	0,39	30,01	63,36	91,14	1,89	109,72	4,61	6,25	4,20
20	0,67	200,42	0,48	129,38	91,11	66,28	-4,39	150,86	0,50	0,67	0,33
21	1,14	379,12	0,73	124,05	221,77	74,54	8,12	134,15	3,47	9,11	2,59
22	2,22	176,60	0,34	42,71	58,77	99,68	2,55	2,55	2,55	2,77	1,54
23	1,11	282,59	0,65	84,79	176,60	97,09	44,54	103,00	10,13	28,13	9,84
24	0,40	-888,40	1,11	-564,35	-564,35	68,57	-1,28	145,84	0,87	-5,06	-5,06
25	4,65	112,64	0,11	57,69	10,87	95,26	2,74	104,98	33,11	35,73	31,54

Source: own calculations.



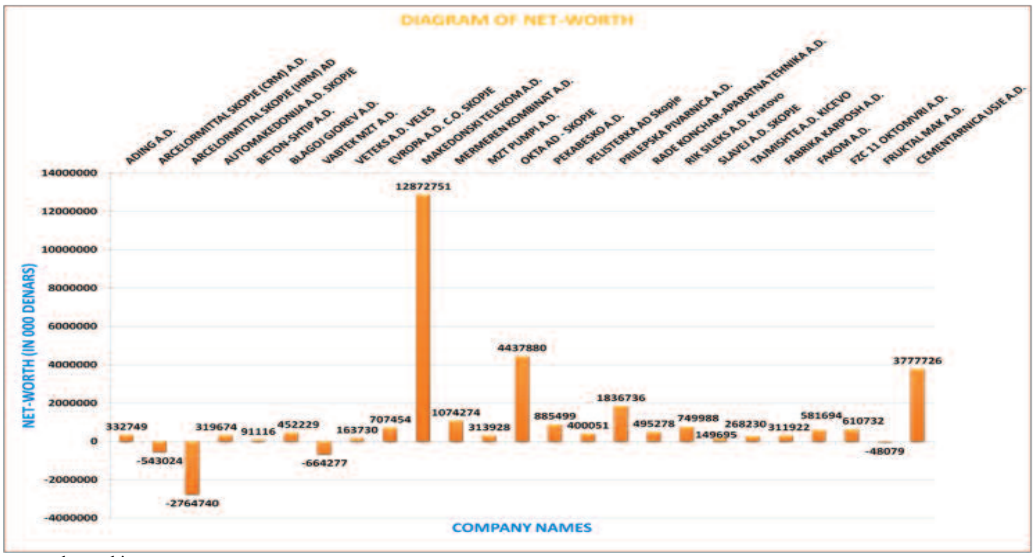
Source: own workmanship.

gram also shows four companies whose net worth is below zero.

Below is a table 3.3, showing the overall state of the companies according to the calculated financial indicators. These companies are ranked according to Dun and Bradstreet credit rating company.Taking into account the results of the Bradstreet, Inc. (DNB).

By computing the key financial indicators for the selected companies by using empirical formulas (formulas (1) to (11), shown in chapter two), was came to the following conclusions in this master's thesis:

- According to the overall condition of the



ource: own workmanship.

'rom the diagram 3.1, it can be seen that CEMENTARNICA USJE JSC, MACEDONIAN TELEKOM JSC and OKTA JSC

analysis of all the financial indicators of these twenty-five companies in this paper, it can be concluded that the results of OKTA JSC, MACEDONIAN TELECOM JSC, CEMENTARNICA USJE JSC, PRILEPSKA PIVARNICA JSC and PEAKEBESKO JSC are at the most satisfactory level.Their financial situation is assessed as stable.

5 CONCLUSION

A credit rating is an opinion given by a specialized agency for the creditworthiness of the issuer or a question based on quantitative and qualitative information. The credit rating is also known as an assessment of the ability of the potential borrower to repay the debt, prepared by a credit rating agency (CRA).

Each agency uses unique letter-based assessments that indicate whether the debt has a low or high standard risk and financial stability of the issuer. Each credit rating agency has its own definition of a credit rating. Largest CRAs are Fitch, Moody's, Standard & Poor's (S & P) and Dun &

companies and the calculated financial indicators, companies were ranked based in the net-worthaccording to Dun and Bradstreet and it comes to a conclusion that we have:

- three companies withFinancial Strength Indicator 5A,
- onecompanywithFinancial Strength Indicator4A,
- four companies withFinancial Strength Indicator 3A,
- twelve companies withFinancial Strength Indicator 2A,
- onecompanywithFinancial Strength Indicator 1Aand
- four companies withFinancial Strength Indicator N.

- According to the overall condition of the companies according to the calculated financial indicators of the total twenty-five analyzed companies in this labor, we conclude that we have:

- sixteen companies whose overall condi-

Table 3.3 The overall condition of companies according to the calculated financial indicators

Company name	Based on Net Worth	Overall conditionbased oncalculated financial indicators
ADING JSC	2A	an overall condition which is Good (low risk).
ARCELORMITTAL SKOPJE (CRM) JSC	N	an overall condition which is Poor (significant level of risk).
ARCELORMITTAL SKOPJE (HRM) JSC	N	an overall condition which is Poor (significant level of risk).
AUTOMAKEDONIJA JSC SKOPJE	2A	an overall condition which is Good (low risk).
BETON-SHTIP JSC	1A	an overall condition which is Fair (slightly greater than average risk).
BLAGOJ GJOREV JSC	2A	an overall condition which is Good (low risk).
VABTEK MZT JSC	N	an overall condition which is Poor (significant level of risk).
VETEKS JSC VELES	2A	an overall condition which is Good (low risk).
EVROPA JSC C.O. SKOPJE	3A	an overall condition which is Good (low risk).
MAKEDONSKI TELEKOM JSC	5A	an overall condition which is Good (low risk).
MERMEREN KOMBINAT JSC	3A	an overall condition which is Good (low risk).
MZT PUMPI JSC	2A	an overall condition which is Fair (slightly greater than average risk).
OKTA JSC - SKOPJE	5A	an overall condition which is Good (low risk).
PEKABESKO JSC	3A	an overall condition which is Good (low risk).
PELISTERKA JSC Skopje	2A	an overall condition which is Good (low risk).
PRILEPSKA PIVARNICA JSC	4A	an overall condition which is Good (low risk).
RADE KONCHAR-APARATNA TEHNIKA JSC	2A	an overall condition which is Good (low risk).
RIK SILEKS JSC Kratovo	3A	an overall condition which is Fair (slightly greater than average risk).
SLAVEJ JSC SKOPJE	2A	an overall condition which is Good (low risk).
TAJMISHTE JSC KICEVO	2A	an overall condition which is Fair (slightly greater than average risk).
FABRIKA KARPOSH JSC	2A	an overall condition which is Good (low risk).
FAKOM JSC	2A	an overall condition which is Good (low risk).
FZC 11 OKTOMVRI JSC	2A	an overall condition which is Fair (slightly greater than average risk).
FRUKTAL MAK JSC	N	an overall condition which is Fair (slightly greater than average risk).
CEMENTARNICA USJE JSC	5A	an overall condition which is Good (low risk).

Source: own workmanship.

tion is Good (low risk).

- six companies whose overall condition is Fair (slightly greater than average risk) and
- three companies whose overall condition isPoor (significant level of risk).

From the total researched twenty-five companies in the labor, companies with the most favorable values of selected key financial indicators are PRILEPSKA PIVARNICA JSC, OKTA JSC, CEMENTARNICA USJE JSC and FZC 11 OCTOBER JSC.

From all the above presented conclusions derived from the calculated values of the financial indicators of the credit rating of the companies in the Republic of Macedonia and the analysis of the obtained values of the credit rating we come to

the general conclusion in this paper, which is that:

Companies in the Republic of Macedonia need to pay more attention to using the credit rating model as a tool for creditworthiness, in order to improve the climate for business decision making and making smart decisions within the companies on the Macedonian market. This avoids possible financial risks when concluding business deals between companies and achieving their permanent growth and development.

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Refugee Crisis: Security Challenges for Macedonia and the Region

MARJAN GJUROVSKI
Faculty of Security – Skopje, North Macedonia mar.gjurovski@gmail.com

RADE RAJKOVCEVSKI
Faculty of Security – Skopje, North Macedonia raderaj@yahoo.com

Abstract

The refugee crisis as a global phenomenon, triggered by several wars in the crisis regions on different locations in Asia and Africa, as well expanded and internationally emphasized by the war in Syria and its surroundings, putted to the test the political and institutional capacities of the European countries and the EU as a global political actor. The approach to solving the problem of the refugee crisis, in the part referring to Europe and addressing the core of the problem on the spot, showed that the EU lacked a rapid and effective response, using mostly ad hoc solutions. Small European countries, even some of them are part of EU, are concerned with the consequences of the refugee crisis without the ability to influence its causes. Using the two different general country's positions regarding the approach to the refugee crisis standpoint of the countries that could manage the crisis and standpoint of crisis manage them, most of concerned countries, that represent the entrance point and collateral damage in this problem, are familiar with second standpoint. The realities in the last few years showed that Balkan countries, as countries which do not have capacity to resist to the supremacy for power and dominance among the major powers, are not target (final destination) for refugees and source of conflict related to the refugee phenomena, as well as they only suffer from its consequences. The war in Syria emphasized its multidimensional destructive potential, and the events and consequences created a need for a redefinition of national security policies and strategies. The paper highlights the refugee crisis as a global phenomenon, as well perspectives of the Republic of Macedonia and Balkans, comparing the EU approach with domestic and regional security policies and strategies. In that term, the goal of the paper is to analyze the on ground realities of refugee phenomenon combined with actions taken by the national governments in wide regional context, as well response of those national security systems in correlation with guidelines of EU policy and decision makers.

Keywords: refugee crisis, global security phenomenon, unilateral approach, smuggling of migrants and human trafficking.

Introduction

In studies related to the phenomenon of refugees, migration is a global phenomenon that affects all countries, regardless of whether they are countries from which refugees fleeing, countries of transit or countries of destination.

Several factors at global level, with some variation of their intensity, produce migrant and refugees' crisis. Some of them are the follows: disruption of the security and stability in regions in the Middle East and North Africa; the existence of double standards in the international world regime; disappearance of prospective for a better tomorrow among the young population in the domicile countries; the strong soft power of EU (especially Germany, France, Sweden and Great

Britain).

About 20 million refugees worldwide have fled their countries for two reasons: the formation of new states and/or conflict rose from the social disorder. The connection of the two factors multiplies the risk and size. Statistically, in the last 5 years 15 new conflicts arose, 8 in Africa, 3 in the Middle East, one in Europe and three in Asia. And some old are restored. According to the UNHCR sources, nearly 60 million people have fled their countries, and a third of them are refugees. It is the largest amount since World War II.

Since the beginning of the wars and instability, around 60 million persons were forced to leave their homes. The refugees and migrants that flee to the EU member countries mainly come from Syria, but also from Afghanistan, Iraq, Somalia, Nigeria, Sudan and Eritrea. In reference to Syria, as a country that has produced the highest number of migrants and refugees in the period from 2011 till May 2016, 4 million people have left the country which amounts to one fifth of its population. The reasons for this are the rule of Bashar Al-Assad as well as the brutality of the terrorist organization ISIS and Jabhat al-Nusra.

According Yoshihiro Francis Fukuyama refugees are one of the three biggest global issues; other two are terrorism and fight for resources. This phenomenon is connected with liberal theory. Every liberal country have moral and real obligation to give shelter on anyone who flees from persecution, war and dictatorship. Right on life is not given by the state so it is not depends on the will of the state where the individual lives, as well as it is the most recognized among main rights in EU and Schengen zone. EU (or liberal concept about state) cannot deny that right, unless the freedom of movement of a person threatens another category. Right of asylum is connected with basic liberal values, so if it is about refugees who are not welcomed in some country, still, in most liberal countries they are tolerated in achieving the right of asylum, only because of the concept of liberal state (S.Knezovic, Regional roundtable "Refugee Crisis: Security Challenges for Macedonia and the region",2015).

The refugee-migrant crisis is a threat from few aspects and already has influence on the economic and social stability as well as on the internal security of the countries through which the migrants transit or remain. Since crisis affected Balkans, it became busiest route used for arrival in the Schengen zone, especially for Germany, Sweden and other Western and Nordic countries as final destinations. It became genuine threat to the national identity (culture, language, religion) and such endangerment that inevitably leads to an increased incidence of xenophobia, nationalism and racism.

The direct decrease of security system's capacities started, affecting the social stability and internal security, when countries deployed regular and additional resources and capacities in term to obtain an appropriate level of internal security as well to provide and allocate resources related to accommodation, health, communal services, transport and other necessities according to the refugees and migrant needs.

The refugee phenomena emphasised a big contradiction, according the route of moving of the refugee wave from non EU to EU member. The realities showed the problem comes from the EU Member State (Greece) and it is shifted in some countries from the Balkans (Macedonia and Serbia) on the way to the refuges' final destination. Even there was not uniform approach within EU, so as consequence the refugees faced with different approaches and procedures by different EU and/or Schengen zone's Member States.

ONE PROBLEM, DIFFERENT PERSPECTIVES

A serious difference within EU approach on the crisis comes mostly due to the persistence of different interests and different intensity of affectation of refugee crisis on each member state. Some of the affected countries (some of them are

not part of EU) and regions built up an authentic standpoint within chosen policies and strategies for mitigating and solving the problem. In this colourful image of approaches, there are several remarkable, such as: EU and EU members' states perspective, Non-EU (Balkan) countries approach, operative (task force) perspective, as well as refugees' perspective.

EU according to mutual security and exterior policy don't have united attitude and show that in the time of crisis EU member states are acting individually. In the case with Ukraine, it is obvious that bigger impact have leaders from Germany and France, than official representative of EU.

Problem with migrants from North Africa for long time and in a lesser extent is present in Malta and the island Lampedusa. According to the EU experiences, crisis shows that EU, which is burdened by other problems, acting ad hoc on issues of strategic importance. That approach is appropriate only if it's about one actor that need to participate in dealing with problem, but is not good if there are 28 actors and it is not systematic solution. Especially when decision-making processes requires consensus, it is difficult to achieve it because the countries have different attitudes and have not developed sufficient culture for harmonized European approach, solidarity and rapid reaction (S.Knezovic, Regional roundtable "Refugee Crisis: Security Challenges for Macedonia and the region",2015).

EU through its security policy takes the form of regulatory power in circumstances where there is no clearly defined military power and facilities as necessary structure and the need for providing more adequate response to resolve the problem. In addition, dealing with the refugee crisis in terms of the seed placement of EU is a very expensive solution, and therefore countries are encouraged to cope with the problem on the basis of national resources (S.Knezovic, Regional roundtable "Refugee Crisis: Security Challenges for Macedonia and the region",2015)

On its route, refugees chose Germany and Sweden as final destinations, mostly due to their economic capacity and social opportunities, i.e. opportunities to receive and care for refugees. Coming to the question "Why Germany and Sweden receive refugees in large numbers?," there are not reasonable explanations, but there are two reasonable indicators, as follows: a) aging population and b) the need for labour, as well as the high sensitivity of the political authorities of these countries on the phenomenon and refugees' suffering. This attitude almost unites the views of politicians and security analysts, but does not explain fully all dilemmas.

Also there is an increased level of xenophobia (islamophobia) in EU, mostly due to the stereotypes according to the thesis that "all refugees are terrorists". Even it was confirmed for some of them (participants in the Brussels and Paris attacks in 2015 and 2016) that they used refugees' waves to achieve their goals; it is very sensitive and hard to explain, as well to put all refugees in terrorist's category. EU and some of the directly affected stated by the terrorist attacks has problem to admire that recruited terrorist come from second and following generations of migrants who are not appropriately integrated within those societies.

Regionally, when the problem from Greece has shifted in the Macedonia and Serbia, as well in other Balkans, it became a strong regional security and political problem. Apart from their sociopolitical status (severe economic problems, slow development performance and problems in social development, limited institutional and regulatory capacity and underdeveloped political culture), the crisis have emerged in regional cooperation. Even the cooperation in recent five years registered a continuous growth and demonstrated high level of cooperation during the floods, this time it did not produce the desired effects. The hottest points of the transit route of refugees appeared on the borders where there is real bilateral

disputes (Macedonia-Greece and Serbia-Croatia) and where conducting of atypical European policy is obvious (Hungary).

More than 750.000 migrants passed through Macedonia in the past year. Macedonia, with modest support from Albania, Slovenia and other neighboring countries, took care of the migrants and organized reception, provided food and medical help. Brussels, Berlin and Washington have to do everything in their power to help countries like Macedonia in facing this challenge (Ariel Cohen, 2016).

Even Republic of Macedonia is a transit on the refugees' route from Syria to the developed EU countries, there is a number of them that decide to stay and ask for asylum.

Unlike route that is used by refugees who are passing through Macedonia, in Serbia since 2013, there are crossings from Bulgaria. In the territory of Republic of Serbia, from January to the middle of September 2015, were detected 136 689 illegal migrants. It is almost 6 times more than in the whole of 2014. Most of the migrants are coming from Syria and Afghanistan. It is prevent illegal crossing of the borders of 3536 migrants, and inside in the territory are detected 106 150 people. 623 criminal charges were submitted against 916 persons for illegal border crossing. It is prevented trafficking of 6426 persons. Migrants usually do not make problems and incidents, so far only 4 criminal charges (till end of October 2015) were submitted (Z. Keshetovic, Regional roundtable "Refugee Crisis: Security Challenges for Macedonia and the region", 2015).

Crisis produces a possibility ISIS to infiltrate his fighters. According some statements, 4000 fighters are operative to act in developed countries. Apart of their socio-economic and political status, Balkans are vulnerable due to the fact that some communities within states (like its Sandzak in Serbia, some parts of Western Macedonia, Bosnia and Kosovo) already have citizens who died for ISIS, who are deeply convinced in ISIS ideology and were mobilized in these spaces (Z. Keshetovic, Regional roundtable "Refugee Crisis: Security Challenges for Macedonia and the region", 2015).

The countries of the region, aware of their opportunities and in the absence of clear guidelines in state policy for dealing with "imported" refugee crisis, long after the eruption of the refugee crisis in the Balkans has not received particular support and guidelines from EU. However, one cannot overlook the assistance given by international institutions in the field of crisis management and humanitarian action (UNIHCR, IOM, UNICEF, Red Cross etc.) which offered expertise and assistance to national authorities in finding appropriate operational and regulatory solutions to mitigate the crisis effects and to reduce the suffering of refugees and organized crime that cover appears associated with human trafficking and migrant smuggling, and whose target were refugees.

In later stages of developments, EU offered financial aid, very symbolic Frontex deployment and initiatives for meetings among political leaders from the region, in term to find a solution to slow up the refugee wave. Even it is more than clear that refugee crisis does not represent a problem with political background; the actions taken by national governments were different according to differences in the national interests and priorities concerning the refugee crisis.

A very important point which the academic community and practitioners have a unanimous view is the way how refugees are treated. Law enforcement authorities police and military (operative) task forces nominated to respond to the refugee and migrant crisis at local level, as institutions that have an immediate contact with the refugees do not have adequate training to deal with this type of humanitarian disaster, although internationally there are already standards incorporated into training manuals and booklets for informing the police and military personnel.

However there has been progress in this area with the intention of introducing specialized training for building approach and dealing with refugees. Contact with refugees is followed by many cases of human access by the security forces (captured by the media), but due to the large influx of refugees and the limited institutional capacities of the countries in some cases, the situation loses control and comes to violent confrontations and disruption of public order and peace to a greater extent. Also, there were noted some examples where refugees are subject to abuse by organized crime groups, primarily in the area associated with human trafficking and migrant smuggling.

The absence of appropriate standard procedures for profiling of refugees does not give a clear picture of the structure of the refugee wave and the danger of certain individuals infiltrated among refugees that should do terrorist acts in some European (transiting or EU) countries.

Refugees have different goals and motivation. The numbers show that over 6 500 000 persons are registered as displaced i.e. refugees, with final destination the countries of Western Europe. The interviewed Syrian refugees in Lebanon and Jordan indicated the sexual violence as one of the main reasons for leaving Syria.

Given the motive of refugees to reach the final destination, passing through his travels and sacrifices of their families, then it is more than clear that any mechanism introduced by the Union may only delay the realization of their purpose. Within the Union has discussed about introducing quotas for the admission of refugees, as neither a solution that will surpass nor European countries that are not part of the EU.

Although refugees use the region for transit to the final destination, there is a risk the refugee crisis with the introduction of quotas for the admission of refugees to cause the demographic shifts that may additionally be present on unemployment, political instability and activation of radical right movements.

Crisis has a health dimension addressed to the possibility to trigger epidemics and health crisis by the occurrence and spread of diseases that are for long time disappeared from this region. Condition of immunity and exhaustion of refugees further affect the intensity and scope of the threat, and on that are added health education of refugees, their attitude towards health and habits, as well as the situation with health systems of the countries of the region in terms of dealing with the serious forms of epidemics and diseases (Z.Keshetovic, Regional roundtable "Refugee Crisis: Security Challenges for Macedonia and the region", 2015).

LESSONS LEARNT AND EXPECTED DEVELOPMENTS

The migrant crisis is a challenge for whole Europe, especially for the smaller countries on the continent, whose economies are in bad and disastrous condition. There is a genuine risk that such pressure can lead to violent clashes with the migrants, and also, it would represent a sort of a test of the relations between the local Muslim and Christian population in the region (Ariel Cohen, 2016).

Although, seemingly, the migration started spontaneously, it can be concluded that it seems like planned and organized transport via the Western Balkan route, including the Republic of Macedonia. The following facts confirm it:

- Telephone guidance (leading) during border crossing;
- Multiple appearance of the same persons in charge of the migrants in the trains transporting the migrants on the route Gevgelija–Tabanovce and vice versa;
- Marking of crossing paths (plastic bottles and textile);
- The existence of locations in Greece where the migrants pay for false IDs and locations for sale of fake travel documents;
- Offering bribery to the members of the

Army of the Republic of Macedonia and the Ministry of Interior for faster and easier transit through Macedonia; and

- There are unconfirmed information that the transport is funded and the funds are obtained at several locations in Turkey and Serbia (Muhamet Racaj, 2015).

The action taken by national authorities showed that problem cannot be transferred to the neighbors and building a holistic approach focused on strong interagency and international approach is more than necessary. Referring to the institutional response, most crisis communication plans adopted by politicians are based on the power play and less based on the principles of humanism, values, morals and ethics. The data that has been presented are quite variable, considering the frequency of migrants and image/perception about borders' happenings.

Conclusion

Migration crisis has launched numerous discussions on the political, professional and social levels. Nevertheless, there are still no concerted opinions about the causes and consequences of the migration crisis in Europe.

In the context of throughout the crisis as far as it takes, concerned countries (alluding to the countries of the region that suffer from its consequences) will be more confused as how to cope and to find a solution. The way in which certain countries, the EU and its institutions are dealing with the crisis looks more like an instinctive reaction rather than a well thought strategy. Migration crisis has its causes in the economic relations at the global level which encourage people to move towards the developed countries. Besides, the causes lie in the increasing number of conflicts in different parts of the world, particularly in the Near East. Migration crisis in Europe is primarily a humanitarian issue and this has been shown in the activities of the majority of the European countries. Migration crisis has resulted also in certain security risks, particularly those related to the threat of terrorism. Therefore, some European countries have tried or managed to securitize this issue. Migration crisis has already caused certain consequences and in the future it will certainly have even greater impact on the European societies, especially their stability and security (Concusions of the Panel discussion "Migration Crisis"University of Applied Sciences Velika Gorica, 2015).

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SOUTH EAST EUROPEAN JOURNAL OF SUSTAINABLE DEVELOPMENT (SEEJSD)
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AIMS AND SCOPE

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