ISSN 2412-5210

International Journal VALLIS AUREA

Volume 5 • Number 1 • June 2019
ISSN 2412-5210

EDITOR'S NOTE

We are delighted to present International Journal Valis Aurea (IJVA) as a result of a successful cooperation between DAAAM International Vienna and Polytechnic in Pozega. Our main objective is to publish fresh, relevant and high-quality research papers. To reach this objective, the journal aims to be accessible, engaging and challenging as well as to involve a worldwide community of scientists, professionals and experts.

The Journal enables authors to present their researches relating to advancing and improving the practice, as well as understanding information systems of the organization. The Journal accepts theoretical, methodological and empirical contributions, i.e. the works that significantly contribute the thematic fields of the Journal, i.e. management, finance, marketing, law, IT technology, agriculture, and other interdisciplinary topics. It will provide enough space for original empirical and developmental researches.

The works can be presented as:

- Theoretical, clear and empirical researches on the conception, structure, development and usefulness of interdisciplinary science being important for the progress of theory and practice.
- Paradigmatic, methodological aspects of design, development and implementation of science and practice.
- Analysis and evolution of science and practice to the social, economic, organizational and management aspects of the environment and organization.

The International Journal Vallis Aurea is a biannual journal, with the pretension to affirm the integral, holistic view of interdisciplinary research. The journal aims to unite the academic methodology and sincerity with professional focus and practices.

We are dedicated to achieve and to maintain this journal's high standards. All articles submitted for publication in this journal are subjected to a double-blind review process performed by at least two academics from the Editor's Board. Reviewers stay anonymous. Authors will receive written notification of acceptance, remarks, comments and evaluation of their articles in a timely manner. Authors are responsible for ensuring that all manuscripts (whether original or revised) are accurately typed

before the final submission. If requested, one set of proof will be sent to authors, before the final publication, which must be returned promptly.

This publication was reproduced by using the papers supplied by their authors. The layout, the figures and tables of some papers did not conform exactly to the standard requirements. In some cases the layout of the papers was rebuild. The readers are therefore asked to excuse any deficiencies in this publication which may have arisen from the above causes. The editors of Journal are not responsible either for the statements made or for the opinions expressed in this publication.

With all our hearts and sincerity, we wish to express our deepest gratitude to all the authors, reviewers, and editorial board members for their valuable contribution for this journal. We look forward to a successful cooperation.

Editors In Chief

PUBLISHERS:

DAAAM INTERNATIONAL VIENNA
POLYTECHNIC IN POZEGA

EDITORS IN CHIEF:

Professor Dr.sc. Dr.mult.h.c.Prof.h.c. BRANKO KATALINIC

BORISLAV MILICEVIC, PHD PROFESSOR

CO EDITOR:

BERISLAV ANDRLIC, PHD

TECHNICAL EDITOR:

MANUEL DEL VECHIO

PUBLICATION PERIOD:

BIANNUAL

CONTACT:

Polytechnic in Pozega, Vukovarska 17, HR 34000 Pozega, E-mail: vallisaurea@vup.hr, homepage: http://www.vallisaurea.org or DAAAM International Vienna, TU Wien, Karlsplatz 13/311, A-1040 Vienna, Austria, E-mail: president@daaam.com, http://www.daaam.info

EDITORIAL BOARD:

Category: original scientific paper

K.A. P., Kollonna [1]
De Alwis A., Chamaru [2]

Social Media Engagement and Occupational Stress

Abstract:

The study attempted to recognized the relationship between social media engagement and occupational stress of millennial employees in private sector, Sri Lanka. It was further evaluated whether the gender moderate the relationship between above two variables. Population of the study is millennial employees who are using Facebook for social media engagement in private sector organizations and used cluster and convenience sampling techniques to select sample units. The sample size of this study was 68 employees. This study mainly based on primary data which collect through a survey. According to survey, 26.47% of employees spend one to two hours for social media and 22.6% respondents used Social Media for update on friend's activity. The study findings revealed that there is a significant moderate positive relationship between social media engagement and occupational stress. Further, it was indicated that relationship between social media engagement and occupational stress was not moderated by the gender. Hence, the study can be concluded that there is a moderate relationship between two factors and gender differences do not strengthen or weaker the relationship between social media engagement and occupational stress.

Keywords:

Social media engagement; occupational stress; millennial employees

Author´s data:

[1] Scholar , University of Kelaniya, Sri Lanka
[2] Department of Human Resource Management University of Kelaniya

UDK 159.96:004.738.5; DOI 10.2507/IJVA.5.1.1.55

Introduction

Seaward (2015) mentioned that stress is the experience of perceived threats (real or imagined) to one's mental, physical, or spiritual well-being, resulting from a series of physiological responses and adaptations. Smith (2000) described stress as a prevalent problem in modern life. Malim and Birch (1998) defined stress as an unpleasant psychological or physiological state produced in response to a stressor. According to Australian Psychological Society (2012) stress is a feeling of being overloaded, wound up tight, tense and worried. Nwadiani (2006) cited evidence from Nweze (1984) occupational stress can be defined as "a disruption of the emotional stability of the individual that induces a state of disorganization in personality and behavior".

According to Fevre, Matheny and Kolt (2003) there are two major types of stress: "eustress and distress". Eustress is defined as "the positive side of stress that motivated people to doing their works". This good stress can be provided motivation or incentive and people can enjoy it. Everyone needs a little bit of stress for their life in order to be challenged and productive. Distress means negative side of stress and people are unable to tolerate it. In terms of eustress perspective, Occupational stress occurs when employees' able to manage their social media engagement with their works. As a result of physiological and psychological pressure employees' cannot meet their job duties and responsibilities as a member of the organization. Occupational stress is the one of most influential factor of workplace health. There are several factors that perform as the occupational stressors and build occupational stressful and unpleasant working environment. At last, those badly affect to the individuals health, family, relationships, money, occupation, and etc.

According to Ismail, Yao and Yunus (2009) cited evidence from Antoniou et al. (1998); Beehr et al. (2001); occupational stress can be sub divided in to two categories as physiological and psychological stress. Physiological stress is viewed through physiological symptoms of the body like headache, migraine, abdominal pain, lethargic, backache, chest pain, fatigue, heart palpitation, sleep disturbance and muscle ache, as well as changes in eating, drinking, sleeping and smoking habits. Conversely, Ismail, Yao and Yunus (2009) cited evidence from Antoniou et al. (2003); Millward (2005); World Health Organization (2005) psychological stress is seen as an emotional reaction such as anxiety and depression burnout, job alienation, hostility, depression, tension, anger, anxiety, nervousness, irritability and frustration. Seaward (2005); Newell (2002); World Health Organization (2005) stated as cited by Ismail, Yao and Yunus (2009) if employees cannot control such stresses this may negatively affect their work attitudes and behavior in the workplace. Social Media (SM) is forms of electronic communication through which users create online communities to share information, ideas, personal messages, and other content (as videos) (Webster, 2014). The most popular SM are Facebook (FB), LinkedIn, Pinterest, Twitter, and Instagram. Technology development is one cause of stress. By using smart devices young generation is logging into SM wherever they stay.

UDK 159.96:004.738.5; DOI 10.2507/IJVA.5.1.1.55

SM is one of the results of technology enhancement and individuals uses SM as their routine task. People who are using SM, stress level can be varied depends on the time they spend. Also people stay in SM based on their satisfaction. Some SM users tend to logout as quick as possible because of stress he felt. Some FB users are failed to bear stress that they felt through SM. Those users try to suicide themselves or murdered by someone else. Lot of examples can be identified, not only in Sri Lankan context However, also in world context (Shanmugarajah, 2014; Arkell, 2013; Milam, 2015; Ellicott, 2011). According to Strickland (2014) identified connections between SM use and negative outcomes such as increased depression, anxiety, compulsive behavior, loneliness, and narcissism. Pantic et al. (2012) found that time spent on FB by high school students was positively correlated with depression. According to Hampton et al. (2015) users who use internet and SM in particular are related to higher levels of stress. Also some researchers say there is no evidence that SM networks like FB and Twitter are a direct cause of stress. Datu, Valdez and Datu (2012) cited evidence from Davila et al. (2012) SM usage was not influenced in anxious or depressive symptoms. However, negative SM experience resulted to depression and decrease positive emotions.

According to American Psychological Association (2011) gender refers to the attitudes, feelings and behaviors that a given culture associates with a person's biological sex. Gabre and Kumar (2012) found that female accounting students reported higher stress scores than their male students. Ingvadóttir (2014) found that gender had the most effect on loneliness However, men reported lower levels of loneliness than women. Furthermore, Hampton et al. (2015) found gender difference is major factor affect for digital technology stress. Their findings were women tend to report more stress than men. However, those women who used a number of digital technologies reported less stress than women who do not use these technologies and women are more aware of stressful events in the lives of their closest friends and family. Conversely, Lutz, Ranzini and Meckel (2014) found that females are less stressed by SNSs than males However, they have stronger feelings of spending too much time. Past researches found gender differently affect social media stress.
Bonds-Raacke and Raacke (2012) mentioned that reason for joining FB is sustaining friendships. According to Labrague (2014) reasons for joining FB include maintenance of relationship, to meet new people, to communicate information, to express their beliefs and some used FB out of boredom. Pempek, Yermolayeva and Calvert (2009) stated adolescents use SNSs as a way to gauge peer opinions about themselves. According to Rosen et al. (2013) significant predictors being FB general use, impression management and friendship. According to Smith (2000) described stress is a prevalent problem in modern life.

Washington (2015) found that internet, cell phone and SM users do not have higher level of stress. However, SM helps to people aware stressful events of their friends' and family lives. If people are aware of undesirable events they feel more stress. Datu, Valdez and Datu (2012) found that there is no significant relationship between respondents' level of depression and the use of Facebook. Moreno et al. (2013) stated as cited by Labrague

UDK 159.96:004.738.5; DOI 10.2507/IJVA.5.1.1.55

(2014), no proof were found for relationship between use of Social Networking Sites (SNSs) and depression. According to Washington (2015) no evidence to prove, SM users feels more stress than people who use digital technologies less or not at all. Society has speculation about SM users feel pressure when they unable to keep up on SM, after watch images shared by friends and feel stress after viewed friends' successful events. However, according to Washington (2015) SM users do not feel any more stress everyday life than non-users or those who only lightly use digital technologies. However, some use of technologies can be indirectly related to stress. By considering social aspect of these technologies, people may feel stress when they see stressful events of others' lives and being reminded of undesirable events of others.

Labrague (2014) found that 99% was FB users and spent at about 90 minutes in FB and not demonstrated FB users suffering from negative emotional states of depression, anxiety and stress. However, time spent on FB increases the likelihood to develop depression and anxiety. According to Pantic et al. (2012) depends on the time spent on SNSs by high school students is related to the risk of depression. According to Bucher (2013) some SM are related stressors in the workplace in positively instead of negative affective reactions. Labrague (2014) mentioned that depression can be occur due to the investing so much time on FB, encounter negative comments, explicit news and negative updates from FB friends.

According to Abrams and Frank (2014) millennial, people who were born in between 1982-2000. They are first global-centric generation and having rapid growth of the internet. Millennial also called Generation Y or Recession generation and they who are 30 years or below. Labrague (2014); Datu, Valdez and Datu (2012) used their study population for adolescents. Furthermore, Strickland (2014) used young adults and Sheldon (2008); Gabre and Kumar (2012) used students who are studying in University. Pantic et al. (2012) based his study on high school students. These researchers participate millennial because they are engaging internet rapidly.

Under this background, the study problem of this study was;"What is the relationship between social media engagement and occupational stress of millennial employees in private sector"? The main objective of this study is to identify relationship between social media engagement and occupational stress of millennial employees.

Significance of the Study

SM is a result of technology development and FB is one of most popular social networking site among the society (Www.make a website.com, 2019) . Now most of people have FB account and they tend to spend more time in FB. As per the digital information world, average time spend on SM is 142 miniutes. According to FB Newsroom (2018) they have 2.32 billion monthly active users of forth quarter 2018. occupational stress is a health risk of employees. It can be affected physically and mentally to employees.

Statistics Hypothesis testing

According to Strickland (2014); Hampton et al. (2015) found use of SM related to higher level of stress.

UDK 159.96:004.738.5; DOI 10.2507/IJVA.5.1.1.55

Conversely, Shaw and Gant (2002) found that when users use of internet significantly decreases loneliness and depression.

According to American Psychological Association (2011) gender refers to the attitudes, feelings and behaviors that a given culture associates with a person's biological sex. Gabre and Kumar (2012); Ingvadóttir (2014); Hampton et al. (2015) found that female reported more stress than men when they use SNSs. Conversely, Lutz, Ranzini and Meckel (2014) found that females are less stressed by SNSs than males.

Many studies have investigated the relationship between FB use and occupational stress However, the results have been ambiguous. This, this study was conducted to clarify this doubt and significantly identify which relationship has in between SM and occupational stress. Also this study was important to employers and employees to get the idea about how to affect SM to millennial employee's work. Also when employees are suffering from stress it leads to unnecessary cost for the organization.

This study operationally defines social media engagement as the "cumulative effect of someone online content in getting their audience's attention". It is an indicator of interest what they offer. According to National Institute of occupational Safety and Health (1999) occupational stress is, when job requirements of employees' do not match with worker's capability, resources and needs that occurs harmful physical and emotional responses. Smith (2000) described stress is a prevalent problem in modern life. This study operationally define occupational stress is feel of mental and physical pressure when the employees unable to fulfill job requirements.

Methodology

Conceptual Framework

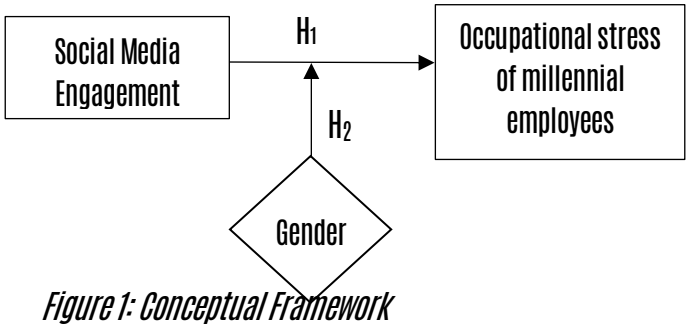


Figure 1: Conceptual Framework
Source: developed base on explolatory study

Hypothesis of the Study

Following hypothesizes were developed based on conceptual framework on the study.
Objective 1: identify relationship between social media engagement and occupational stress of millennial employees.

Alternative hypothesis (H1a) - There is a significant relationship between degree of social media engagement (μSM) and occupational stress level (μJS) of millennial employees.
H1: $\mu SM \neq \mu JS$
Corr (μSM, μJS) < > 0
Where,
Correlation: $Corr(x,y) = E[(x-E[x])(y-E[y])]/{}_{\delta}x_{\delta}y$
E[x] is the expected value (mean) of x. ${}_{\delta}x$ is the standard deviation of x. Corr(x,y) > 0 for positive relationship. Corr(x,y) < 0 for negative relationship. Corr(x,y) = 0 for no relationship.

UDK 159.96:004.738.5; DOI 10.2507/IJVA.5.1.1.55

Alternative hypothesis (H2a) - Gender of employees (μG) significantly moderates the relationship between social media engagement (μSM) and occupational stress (μJS) of employees

$\mu JS = C0 + C1\mu SM + C2\mu G + C3(\mu SM\mu G)$ C0, C1, C2, C3 are constants. $C3 \neq 0$

Population of the study is millennial employees who are using FB in private sector organizations. According to Abrams and Frank (2014) millennial, people who were born in between 1982-2000. They are first global-centric generation and having rapid growth of the internet. Millennial also called Generation Y or Recession generation and they who are 30 years or below.

It comprises some members selected from population. This study sampling method was non-probability sampling. A researcher use cluster and convenience sampling techniques which was one technique in non-probability sampling for sample selection. The sample size of this study was 68 employees. According to Smith (2013) calculate sample size as statistic has to determine confidence interval, margin of error and standard deviation. Confidence interval of population was assumed 90% confidence (Z-Score =1.645), margin of error of sample is +/- 10% and standard deviation is 0.5.

This study mainly based on primary data which collect through a survey. Standard questionnaire was used to collect data regarding social media engagement and occupational stress. The questionnaire section 1 contained of 1 questions and section 2 contained of 11 questions regarding social media engagement. Also section 3 contained of 14 questions and took approximately 10 to 15 minutes to complete. This questionnaire was included closed ended questions.

According to Phelan and Wren (2005) reliability is the degree to which an assessment tool produces stable and consistent results. Test-reset reliability, Parallel forms reliability, inter-rater reliability and internal consistency reliability were mentioned (Phelan and Wren, 2005). The Cronbach's Alpha test was used to test the internal consistency. In general Cronbach's Alpha more than 0.7 is good. Before conduct data analysis reliability test were conducted. Cronbach's alpha is 0.832 and 0.906 respectively, which indicates a high level of internal consistency. According component matrix social media engagement variable value is above 0.5 for 8 questions and question 5 value is below 0.5. However, extraction sums of squared loadings cumulative value is 79.157%. It is above 50% of the standard margin of factor analysis. Therefore, regarding social media engagement questions are validated.

According component matrix occupational stress variable value is above 0.5 for12 questions and 2 question values are below 0.5. However, extraction sums of squared loadings cumulative value is 88.433%. It is above 50% of the standard margin of factor analysis. Therefore, regarding occupational stress questions are validated.

Results and Discussion

Millennial employees 25% (N=17) were spent less than 30 minutes in SM sites while 23.5% (N=16) of employees spent between 30 minutes to 1 hour.

UDK 159.96:004.738.5; DOI 10.2507/IJVA.5.1.1.55

26.5% (N=18) of employees expended in between 1 hour to 2 hours and more than 2 hours used SM 25% (N=17) of millennial employees. 22.2% millennial employees (N=54) use SM for keep in touch with friends and family while 11.5% employees (N=28) use to meet new people. 19.8% (N=48) and 22.6% (N=55) employees use to share photos, videos and music and update friend's activity. 39.70% (N=27) employees who used SM to play games and 12.8% (N=31) employees use it for

2. Model summary of social media engagement and occupational stress, Source: Survey data 2018

Significant value (P=0.001) is less than 0.05, then independent and dependent variable are significant (table). Based on these findings, the alternative hypothesis (H1) is accepted because majority in the sample has accepted that social media engagement has a positive impact for their occupational stress and the null hypothesis is

Model	R Gender = Male (Selected)	R Square	Adjusted R Square	Std. Error of the Estimate
1	.374a	.140	.113	7.01685

a. Predictors: (Constant), Social Media Engagement

rejected.

Table 3. ANOVA between social media engagement and occupational stress, Source: Survey data 2018

Moderate effect of gender to the relationship between social media engagement and occupational stress

Alternative hypothesis (H2a) - Gender of employees (μG) significantly moderates the relationship between social media engagement (μSM) and occupational stress (μJS) of employees

$\mu JS = C0 + C1\mu SM + C2\mu G + C3(\mu SM\mu G)$ C0, C1, C2, C3 are constants. $C3 \neq 0$

The Moderated Multiple Regression model was run to find whether the association between social media engagement and occupational stress moderates with gender. Results indicated that without gender as moderating factor, relationship was significant (P= 0.001) according to table 3.

Gender (male) was affected social media engagement by 14% (table 4.). Male (P=0.030) was not significant factor for social media engagement and occupational stress.

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	991.476	1	991.476	12.435	.001a
Residual		66	79.734		
Total	6253.941	67			

a. Predictors: (Constant), Social_Media_Engagement

b. Dependent Variable: Job_Stress

Table 4. Model summary of moderating factor gender-male, Source: Survey data 2018

UDK 159.96:004.738.5; DOI 10.2507/IJVA.5.1.1.55

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	255.500	1	255.500	5.189	.030 a
	Residual	1575.559	32	49.236		
	Total	1831.059	33			

a. Predictors: (Constant), Social_Media_Engagement

b. Dependent Variable: Job_Stress

Table 5. ANOVA of moderating factor gender - male, Source: Survey data 2018

Gender (female) was affected social media engagement by 26%. However, female (P=0.002) also was not significant factor for social media engagement and occupational stress.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	Gender = Female (Selected)			
1	.517a	.267	.244	9.92945

a. Predictors: (Constant), Social Media Engagement

Table 6. Model summary of moderating factor gender - female, Source: Survey data 2018

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	1148.759	1	1148.759	11.651	.002a
	Residual	3155.006	32	98.594		
	Total	4303.765	33			

a. Predictors: (Constant), Social Media Engagement

b. Dependent Variable: Job_Stress

Table 7. ANOVA of moderating factor gender - female, Source: survey data 2018

These results indicated that relationship between social media engagement and occupational stress was not moderated by the gender. Therefore, alternative hypothesis (H2a) was rejected.

Conclusion

This study was intended to identify the relationship between social media engagement and occupational stress of millennial employees in Sri Lanka. The findings of the study confirmed that there is a significant moderate level positive relationship. Further, study reconfirmed the outcome of the previous research done by Labrague(2014), Pantic et al. (2011), Rosen et al., (2013) and Gabre and Kumar (2012). In addition, study do not have any evidance to prove whether gender moderates the relationship between social media engagement and occupational stress (male P=0.030 and female P=0.002). However, past researchers found that gender is affected to the relationship between social media engagement and occupational stress (Gabre and Kumar, 2012, Ingvadóttir, 2014, Hampton et al., 2015, Lutz, Ranzini and Meckel, 2014). This study conclude gender do not affect as a moderator and did not help to strength or cancel the relationship between social media engagement and Occupational stress.

Referances

[1]Abrams, J., & Frank, V. (2014). The Multigenerational Workplace. SAGE Publications.

[2]American Psychological Association. (2011). Definition of Terms: Sex, Gender, Gender Identity, Sexual Orientation. American Psychological Association.

UDK 159.96:004.738.5; DOI 10.2507/IJVA.5.1.1.55

[3]Antoniou, A. S., Polychroni, F., & Vlachakis, A. N. (2006). Gender and age differences in occupational stress and professional burnout between primary and high-school teachers in Greece. Journal of Managerial Psychology, 682 - 690.
[4]Arkell, H. (2013, November 26). Coroner warns of dangers of Facebook after student, 19, targeted by young women bullies online hanged himself. Retrieved October 04, 2015, from Mail online: http://www.dailymail.co.uk/news/article-2513782/Facebook-bullies-led-suicide-student-19-hanged-himself.html
[5]Australian Psychological Society. (2012). Understranding and Managing Stress. Retrieved 2015, from Australian Psychological Society: https://www.psychology.org.au/Assets/Files/StressTipSheet.pdf
[6]Bonds-Raacke J, R. J. (2012). MySpace and Facebook: Identifying dimensions of uses and gratifications for friend networking sites. Individual Differences Research, 8(1): 27-33.
[7]Bucher, E. (2013). The Stress of Being Social - Essays on Social Media in the Workplace. The University of St. Gallen.
[8]Datu, J. A., Valdez, J. P., & Datu, N. (2012). Does Facebooking make us sad? Hunting relationship between Facebook use and depression among Filipino adolescents. International Journal of Research Studies in Educational Technology, 1(2): 83-91.
[9]Davila, J., Hershenberg, R., Feinstein, B. A., Gorman, K., Bhatia, V., & Starr, L. R. (2012). Frequency and Quality of Social Networking Among Young Adults: Associations With Depressive Symptoms, Rumination, and Corumination. Psychology of Popular Media Culture, 72-86.
[10]Ellicott, C. (2011, July 28). The schoolgirl killed for a bet: Boy, 16, was dared by Facebook friends to murder in exchange for a free breakfast. Retrieved October 4, 2015, from Mail online: http://www.dailymail.co.uk/news/article-2019409/Joshua-Davies-16-dared-Facebook-friends-murder-Rebecca-Aylward.html
[11]Fevre, M., Matheny, J., & Kolt, G. (2003). Eustress, distress, and interpretation in occupational stress. Journal of Managerial Psychology, 726 - 744.
[12]Gabre, H., & Kumar, G. (2012). The Effects of Perceived Stress and Facebook on Accounting Students' Academic Performance. Accounting and Finance Research, 87-100.
[13]Hampton, K. N., Rainie, L., Lu, W., Shin, I., & Purcell, K. (2015). Socil Media and the Cost of Caring. America: Pew Research Center.
[14]Ingvadóttir, A. B. (2014). The Relationship between Facebook Use and Loneliness: A Comparison Between High-School Students and University Students. Author.
[15]Ismail, A., Yao, A., & Yunus, N. K. (2009). Relationship Between Occupational Stress and Job Satisfaction: An Empirical Study in Malaysia. The Romanian Economic Journal, 3-29.
[16]Labrague, L. J. (2014). Facebook use and adolescents' emotional statesof depression, anxiety, and stress. Health Science Journal, 8(1).
[17]Lutz, C., Ranzini, G., & Meckel, M. (2014). Stress 2.0: Social Media Overload Among Swiss Teenagers. Emerald Insight, 3-24.

[18]Malim, T., & Birch, A. (1998). Introductory Psychology. Palgrave Macmillan.
[19]Milam, W. (2015). The 14 Craziest Deaths Caused by Social Media. Retrieved October 4, 2015, from Ranker: http://www.ranker.com/list/the-13-craziest-deaths-caused-by-social-media/whitney-milam
[20]Moreno, M., Jelenchick, L., Egan, K., Cox, E., Young, H., Gannon, K., et al. (2011). Feeling Bad on Facebook: Depression disclosures by college students on a Social Networking Site. National Institute of Health, 447-455.
[21]Nwadiani, M. (2006). Level of perceived stress among lectures in Nigerian universities. Retrieved September 28, 2015, from Free patents online: http://www.freepatentsonline.com/article/Journal-Instructional-Psychology/144014463.html
[22]Pantic, I., Damjanovic, A., Todorovic, J., Topalovic, D., Bojovic, J. D., Ristic, S., et al. (2012). Association Between Online Social Networking and Depression in High School Students: Behavioral Physiology Viewpoint. Zagreb: Medicinska naklada.
[23]Pempek, T., Yermolayeva, Y., & Calvert, S. (2009). College students' social networking experiences on Facebook. Journal of Applied Developmental Psychology, 227-238.
[24]Phelan, C., & Wren, J. (2005). EXPLORING RELIABILITY IN ACADEMIC ASSESSMENT. Retrieved November 4, 2015, from UNI: https://www.uni.edu/chfasoa/reliabilityandvalidity.htm
[25]Rosen, L., Whaling, K., Rab, S., Carrier, L., & Cheever, N. (2013). Is Facebook creating ''iDisorders''? The link between clinical symptoms of psychiatric disorders and technology use, attitudes and anxiety. Computers in Human Behavior, 1243-1254.
[26]Seaward, B. L. (2015). Managing Stress : Principles and Strategies for Health and Well-Being. Burlington: Jones and Bartlett Learning.
[27]Shanmugarajah, K. (2014, February 19). Elpitiya girl commits suicide - possibly over Facebook image. Retrieved October 4, 2015, from News 1st: http://newsfirst.lk/english/2014/02/girl-commits-suicide-facebook-image/21210
[28]Shanmugarajah, K. (2014, February 19). Kurunegala school principal speaks out after being released on bail. Retrieved October 4, 2015, from News 1st: http://newsfirst.lk/english/2014/02/newsfirst-delves-deeper-facebook-suicide-incident/21222
[29]Shaw, B. A., & Gant, C. S. (2002). In Defense of the Internet: The Relationship between Internet Communication and Depression, Loneliness, Self-Esteem, and Perceived Social Support. Cyberpsychology & Behavior, 5:157-171.
[30]Sheldon, P. (2008). The Relationship Between Unwillingness-to-Communicate and Students' Facebook Use. Journal of Media Psychology, 67-75.
[31]Smith, A. (2000). The scale of perceived occupational stress. UK: Great Britain.
[32]Smith, S. (2013, April 8). Qualtrics. Retrieved October 14, 2015, from Determining Sample Size: How to Ensure You Get the Correct Sample Size: https://www.qualtrics.com/blog/determining-sample-size/
[33]Strickland, A. C. (2014). Exploring the Effects of Social Media use on the mental Health of Young Adults.

UDK 159.96:004.738.5; DOI 10.2507/IJVA.5.1.1.55

[34]Washington. (2015). Social media users do not have more stress than others but digital technology users are more aware of stressful events in the lives of friends and family, and that stress is contagious. Pew Research Center.

[35]Webster, M. (2014). Social Media. Retrieved August 2015, from Merriam Webster: http://www.merriam-webster.com/dictionary/social%20media

UDK 159.96:004.738.5; DOI 10.2507/IJVA.5.1.1.55

PHOTO 1.
Aronia Blossom
PHOTO BY: JOSIP MESIĆ

Category: original scientific paper

Stjepić, Ana-Marija [1]
Vukšić, Marija [2]
Suša Vugec, Dalia [3]

Digital Literacy of the Generation Z Students and Their Attitudes and Beliefs Towards ICT Knowlegde and Skills

Abstract:

Technology is rapidly developing and new generations easily adopt technological innovations. The education system is beginning to realize the increasing importance of adapting its education style to suit the specific characteristics of the new generations. Generation Z represents students who are born and raised in the highly progressed digital environment. Therefore, using the survey method, an analysis within the current Generation Z was made, focused on their digital literacy as well as perception and attitudes towards ICT learning, knowledge and skills.

Keywords:

generation Z; students; digital literacy; ICT knowledge and skills

Author´s data:

[1] Assistant, University of Zagreb, Faculty of Economics and Business, Trg J.F. Kennedyja 6, astjepic@efzg.hr
[2] PhD student, University of Zadar, Postgraduate study of Humanities, Ul. Mihovila Pavlinovića, marvuksic@student.unizd.hr
[3] Assistant, University of Zagreb, Faculty of Economics and Business, Trg J.F. Kennedyja 6, dsusa@efzg.hr

UDK 316.774:004-057.875; DOI 10.2507/IJVA.5.1.2.56

VALLIS AUREA

Introduction

Over the last couple of decades, there has been an increase of interest in information and communication technology (ICT) in both private and business areas of life. It is mainly due to the constant development of new ICT technology and the need to tailor it according to both personal and business preferences of its consumers. The ICT development in turn shaped values, characteristics and mindsets of each new generation of people [1]. Every new generation grows up in a different socioeconomic, cultural and technological context than the previous generation, and as a result each generation has its own way of thinking, communicating and reacting to everyday situations [2]. In the context of education, new generations represent a certain challenge for educational institutions [3]. Since Generation Z, which is the observed generation for the purpose of this paper, has been influenced by rapid technological development and ever faster progress of digital technology, its ICT knowledge and skills are one of the key drivers in transforming the existing learning approaches [3], [4], [5]. According to Pejić Bach, Bosilj Vukšić and Ćurko [6], computer literacy is one of the crucial foundations of successful education and business.

Having in mind all of the above, the aim of this paper is to explore the digital literacy and attitudes of students belonging to Generation Z regarding the ICT knowledge and skills. For that purpose, following research questions have been formed: (RQ1) Are there any statistically significant differences in perceived digital literacy of Generation Z students before and after the Business Informatics course?, (RQ2) What are the attitudes of Generation Z students towards ICT learning?, and (RQ3) What is the Generation Z students' perceived usefulness of ICT knowledge and skills?

In order to meet the aim of the paper and to answer these research questions, this paper is organized as follows. The second part of this paper sums up the classification of different generations, gives a brief overview of Generation Z students' characteristics and shows the teaching methods for Generation Z students in the time of highly advanced digital technology. Research methodology is explained in the third part of the paper, while the results of the conducted surveys are presented and discussed in the fourth part. Finally, concluding remarks as well as limitations and recommendations for future research are given in the fifth part of the paper.

Theoretical background

Classification of generations

Generational differences were first introduced by Strauss and Howe [7]. According to Berkup [1] and Bennett [8] every new generation has its own characteristics depending on the cultural, socioeconomic and political context that surrounds it. There is no definitive classification of generations in the existing literature, but some general conclusions can be drawn. We use the classification given by Berkup [1] in Table 1 as an example of one possible classification of generations for the purpose of illustrating an approximate historical period to which each generation belongs, but it should be noted that the classifications of generations in the existing literature often slightly vary from each other.

UDK 316.774:004-057.875; DOI 10.2507/IJVA.5.1.2.56

Time period	Name of the generation
1900 - 1945	Builders
1946 - 1964	Boomers
1965 - 1979	Generation X
1980 - 1994	Generation Y
1995 - Present	Generation Z

Table 1 Classification of Generations; Source: [1]

Builders also known as the "Silent Generation" [9] were defined by several serious and important events that happened in that period [9], [1]. They were affected by the events and the aftermath of World War I (1914-1918) and World War II (1939-1945), as well as The Great Depression, which lasted from 1929 to 1939 [1]. It is important to note that some authors, such as Carlson [10] and Strauss and Howe [7], split the Builders into two generations. The Good Warrior generation that was born in the early 1900s and the Silent Generation that was born in the late 1920s. The Good Warrior generation fought in World War II and experienced the Great Depression, while the members of the Silent Generation did not yet reach adulthood [10]. When the Silent Generation reached adulthood, they reaped the benefits of an economic recovery in the 1950s and the 1960s resulting in early marriages and a high birth rate or baby boom [10]. Hence the name Boomers of the next generation that was born between 1946 and 1964 [1] Because there were so many of them, they had to learn to work together and were the first generation whose ability to cooperate and share with others was actually graded positively in educational institutions [11].

Next was Generation X that included people born between 1965 and 1979 who were heavily influenced by sudden technological advancement, including the appearance of personal computers [1]. This was the first generation that used various features of accessible technology to simplify its work tasks [1].

The next generation was Generation Y whose members were born between 1980 and 1994 [1]. Because they were influenced by the further technological development, the members of this generation are also known as Generation Next [12], Digital Generation [13], Nexters [11], Echo Boomers [12], [14], trophy Kids [1], [15], Generation www [1], [15], Net Generation [14], NetGen [16] or Gen N [1], [15]. Mobile phones, the Internet, and social networks were an essential part of their everyday lives [4]. The technological shrewdness of the Generation Y gave rise to new trends in learning such as the increase in popularity of informal types of learning, as well as using new technologies as tools to help with the learning process [4].

Generation Z

Some authors do not differentiate between the Generation Y and the Generation Z, calling all born between 1978 and 2000 the "Millennial Generation" [4]. However, the Generation Z was born after 1996, they grew up using social networks and are even more digitally oriented than the Generation Y, thus requiring a different analytical approach [4]. This Generation also has many other names, such as: Gen Tech [4], [17], Children of Internet [1], [18], Post-Millenials [16], [19], Generation I [1], [18], Digital Natives [1], [18], [20], Gen Wii [4], [17], Media Generation [1], [18], .com Generation [1], [18], iGen [1], [18].

Since the members of this generation frequently use digital technologies and social networks for social interactions, they rely heavily on the online world [20], [21]. Students that are members of this generation are not accustomed to thinking critically about the information they read online and the sources of those information [3], [5], [14], [22] The large amount of available information that is being received and processed on a daily basis resulted in students having shorter attention spans and taking longer to complete a single task [1], [3], [14]. Because the members of the Generation Z spend a lot of time by themselves, reading about the current events and communicating with others via digital devices, their process of learning is often intrapersonal [5]. At the beginning of their learning process, the students belonging to this generation want to independently acquire new knowledge via various types of digital technology [5], [20]. Later in the learning process, when they are already familiar with the learning matter, they relax enough to work in groups [5]. The students of Generation Z are not able to memorize as much information as the previous generations and they find it more important to know how to find specific information in the vast sea of data available on the Internet [14]. Consequently, they are skilled in filtering and sorting the information they need, which makes them a new generation of learners [14].

Learning process of Generation Z in the digital era

To be born and to live in an environment that is heavily influenced by technology is shaping the members of Generation Z in an entirely different way and it is affecting the way in which they behave in social interactions and adopt new knowledge [19]. Therefore, most educational institutions have to seriously consider reorganizing their learning strategies and their way of teaching to be more effective for the future generations [19]. According to Arkhipova et al. [3], among the new generations of students, there is no need for physical libraries, since all the information is immediately available on the Internet [23].

That is why the Generation Z students are active learners prone to multitasking that often have shorter and insufficient attention spans [1], [3], [14]. According to Persada [20], regardless of whether its formal or informal learning, Generation Z students will often turn to digital devices and sources to help them with the learning process. Therefore, educational institutions have to better understand the learning needs of the future generations and adjust their programs and teaching methods to meet and satisfy these new requirements to achieve sufficient quality for both students and teachers [3], [24]. The Generation Y was focused on e-learning or m-learning, but for Generation Z, those two learning methods are combined under the commonly used term "Digital learning" [20], [25]. Digital learning is based on using different digital tools and mobile devices to motivate students to utilize various academic documents, sources, books, journals, video clips, etc. that will help them in acquiring new knowledge [20]. Because of Generation Z, traditional universities now have to prioritize the needs of their students when defining and designing curriculums [5], [26].

UDK 316.774:004-057.875; DOI 10.2507/IJVA.5.1.2.56

Research methodology

Research description

For the purpose of meeting the aim of this paper and answering the research questions stated in the Introduction, a survey has been conducted in two stages on a sample of first year students enrolled into the integrated undergraduate and graduate university study programme of business economics and economics at the Faculty of Economics & Business, University of Zagreb, Croatia. First stage of the research has been conducted in September 2018 in the first week of Business Informatics course, while the second stage has been conducted in January 2019, in the last week of Business Informatics course.

The survey for the first stage contained, among others, questions regarding the level of digital literacy, as well as the questions regarding the attitudes towards ICT learning. The second part of the survey is based on the work of Ng [27] who also examined the students' attitudes towards ICT learning. The survey for the second stage also contained questions regarding the level of digital literacy and the questions regarding the students' interest and perceived usefulness of the ICT knowledge and skills which they could learn during the Business Informatics class. In both surveys, a 5 point Likert scale has been used in all questions.

Collected answers have been analysed using methods of descriptive statistics as well as t-test statistics for investigating the existence of statistically significant differences in answers before and after the course. The results of the analysis have been further discussed in the following section.

Sample characteristics

Total of 192 students participated in the first stage of the research, answering the questions in the first week of Business Informatics course. However, since this study focuses only on the students belonging to Generation Z, the obtained data has been cleansed in order to exclude students born before 1995 as a threshold year for Generation Z. For that purpose, total of six responses have been excluded from the further analysis. Therefore, 186 responses have been further analysed. Next, total of 155 students participated in the study after the Business Informatics course. Again, for the purpose of analysing only the answers from Generation Z students, total of eight responses have been excluded from the further analysis, leaving 147 responses in the final sample for the analysis. Table 2 presents the sample characteristics.

Characteristic		Before course (n=186)		After course (n=147)	
		N	%	N	%
Gender	Male	57	30,65%	41	27,89%
	Female	129	69,35%	106	72,11%
Student status	Full-time	94	50,54%	113	76,87%
	Part-time	92	49,46%	34	23,13%

UDK 316.774:004-057.875; DOI 10.2507/IJVA.5.1.2.56

Characteristic		Before course (n=186)		After course (n=147)	
		N	%	N	%
First enrollment in academic year 2018/2019	Yes	174	93,55%	110	74,83%
	No	12	6,45%	37	25,17%
Employment	Employed	13	6,99%	7	4,76%
	Employed as a student	30	16,13%	31	21,09%
	Not employed	143	76,88%	109	74,15%

Table 2. Sample characteristics

Results and discussion

Perceived level of digital literacy

The first research question referred to the existence of statistically significant differences between the Generation Z students' perceived level of digital literacy before and after the Business Informatics course. The results of the survey according to the digital literacy levels are presented in the Table 3. Half of the surveyed students (50%) perceived their level of digital literacy to be average before taking the Business Informatics course, while minority of them (only 1.08%) perceived their digital literacy level as very good. On the other hand, in the survey which took place after the Business Informatics course, majority of the surveyed students perceived their level of digital literacy as good (43.54%), followed by those who perceived their digital literacy level as very good (38.10%), while there were no students which perceived their digital literacy to be very weak.

Digital literacy level	Before course (n=186)	After course (n=147)
Very weak	4,30%	0,00%
Weak	20,43%	1,36%
Average	50,00%	17,01%
Good	24,19%	43,54%
Very good	1,08%	38,10%
Average digital literacy grade (mean)	2,973	4,184
Standard deviation	0,815	0,759
T-test	13,874	
p-value	<0,0001	

Table 3. Perceived level of digital literacy before and after the Business Informatics course

The results of the surveys revealed that the average digital literacy grade of students before taking the Business Informatics course was 2.973 with the standard deviation of 0.815, while it was 4.184 with the standard deviation of 0.759 after the course.

UDK 316.774:004-057.875; DOI 10.2507/IJVA.5.1.2.56

The results of the t-test revealed that the difference between average digital literacy grades before and after the course is statistically significant at 1% level (t=13.874, p<0.0001).

There are some interesting findings in the presented results. Although Generation Z is born and raised surrounded by computers and digital technologies and its members are considered as "digital natives", they did not self-evaluate their digital literacy as very good before they took the Business Informatics course. However, their self-evaluation level of digital literacy increased significantly after taking the course which means that it still makes sense to teach digital natives about digital technologies. In other words, it is not enough to be surrounded by digital technologies from very young age in order to achieve higher levels of digital literacy; one can achieve it by engaging in the sort of education that will provide valuable ICT knowledge and skills.

Attitudes towards ICT learning

The second research question referred to the Generation Z students' attitudes towards ICT learning. Following work of Ng [27], seven statements using 5-point Liker scale were provided in the survey in order to investigate students' attitudes towards ICT learning. Those statements are: (i) I like using ICT for learning, (ii) I learn better with ICT, (iii) ICT makes learning more interesting, (iv) I am more motivated to learn with ICT, (v) ICT enables me to be a self-directed and independent learner, (vi) There is a lot of potential in the use of mobile technologies (e.g. mobile phones, PDAs, iPods, smartphones, etc.) for learning, and (vii) Teachers/lecturers should use more ICT in their teaching of my classes [27]. Named statements are the part of the before Business Informatics course survey. The results of the survey are given by the Table 4. For most of the statements, majority of the surveyed students neither agree nor disagree with the statement. However, the exceptions are the last two statements. Majority of the students (37.10%) strongly agrees that there is a lot of potential in using mobile technologies in educational process. Also, majority of the surveyed students strongly agrees (31.18%) and agrees (31.18%) that the teachers and lecturers should use more ICT in the educational process.

Attitude statement	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I like using ICT for learning	7,53%	10,75%	31,18%	25,81%	24,73%
I learn better with ICT	9,68%	14,52%	41,40%	18,82%	15,59%
ICT makes learning more interesting	9,14%	14,52%	34,95%	24,73%	16,67%
I am more motivated to learn with ICT	12,90%	15,59%	40,86%	17,20%	13,44%
ICT enables me to be a self-directed and independent learner	8,06%	17,74%	40,86%	18,28%	15,05%

UDK 316.774:004-057.875; DOI 10.2507/IJVA.5.1.2.56

Attitude statement	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
There is a lot of potential in the use of mobile technologies (e.g. mobile phones, PDAs, iPods, smartphones, etc.) for learning	1,08%	5,38%	27,42%	29,03%	37,10%
Teachers/lecturers should use more ICT in their teaching of my classes	3,76%	4,84%	29,03%	31,18%	31,18%

Table 4. Attitudes towards ICT learning

The presented results indicate that, although surveyed students are digital natives, their attitudes towards using ICT in educational process are not as strong. Nevertheless, if summarized scores for agreement and strong agreement are taken into account, it is visible that majority of the students have positive attitude towards ICT usage for learning purposes. On the other hand, although Generation Z students perceive that ICT can make learning process more interesting, majority of them do not believe that ICT can increase their learning skills or make them independent learners nor are motivated to learn with ICT. Moreover, students believe that more ICT should be used in educational process. However, one should keep in mind that the majority of the students have been answering this questions before taking any of the university level classes (there were 93.55% of the students in the sample who were first-time students in the observed academic year), so the results of the final statement could, in fact, be considered as guidelines for high school teachers to introduce more ICT in their teaching methods.

Usefulness of ICT knowledge and skills

The third research question referred to the Generation Z students' perception of usefulness of ICT knowledge and skills which they obtained during the Business Informatics course. The questions regarding this topic have been a part of the second survey which took place after the Business Informatics course. This part of the research has been divided into two parts: (i) perceived usefulness of the topics belonging to the theoretical part of the course and (ii) perceived usefulness of the topics belonging to the practical part of the course. All of the questions have been based on a 5-point Likert scale with 1 representing very low usefulness, and 5 represented very high usefulness.

The perceived usefulness of the topics belonging to the theoretical part of the course consists out of ten topics, being: (i) hardware, (ii) software, (iii) data, (iv) computer networks and IT, (v) designing Web sites, (vi) information systems in business, (vii) business decision-making systems, (viii) electronic business, (ix) risks and IT implementation in business, and (x) organization and management of IT as a business function. The results of the survey reveal that, among named theoretical topics, students of the Generation Z perceive Electronic business to be the most useful topic, while Data is the least useful topic according

UDK 316.774:004-057.875; DOI 10.2507/IJVA.5.1.2.56

to their opinions, as presented by the Figure 1. However, all of the calculated average grades (means) range from 3.54 (with standard deviation of 1.16) for Data to 3.80 (with standard deviation of 1.18) for Electronic business, which cannot be considered as a wide range so it can be concluded that the average overall perceived usefulness of the theoretical topics taught in the Business Informatics course is middle to high, with an overall average score of 3.64 (with standard deviation of 0.11).

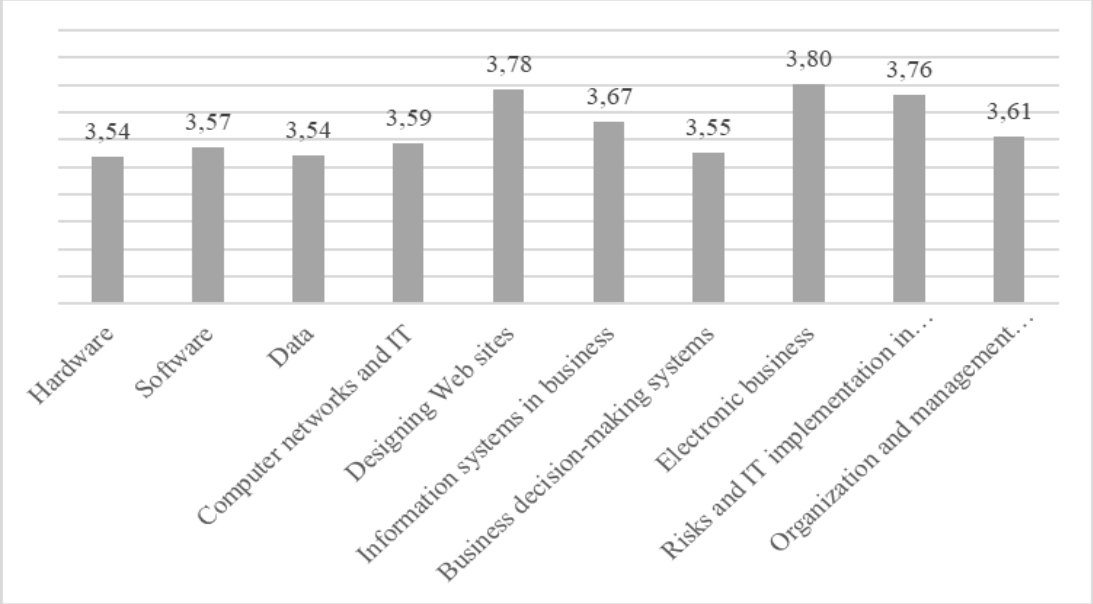


Figure 1. Perceived usefulness of the theoretical Business Informatics course topics

The perceived usefulness of the topics belonging to the practical part of the course consists out of nine topics, being: (i) computer fundamentals, (ii) databases, (iii) Internet services in business, (iv) Web sites design, (v) text processing, (vi) desktop publications, (vii) public presentations, (viii) spreadsheets, and (ix) electronic business. The results, as presented by the Figure 2, indicate that Spreadsheets is the most useful topic among practical topics of the Business Informatics course with an average grade of 4.65 and standard deviation of 0.72, while the least useful topic is perceived to be Desktop publications with an average usefulness grade of 4.39 and related standard deviation of 0.95. Again, as in the case of theoretical topics, the range of the average grades of the individual topics is not wide. The overall usefulness of the practical part of the Business Informatics course can be considered high, with an overall average value of 4.58 (with the standard deviation of 0.09).

UDK 316.774:004-057.875; DOI 10.2507/IJVA.5.1.2.56

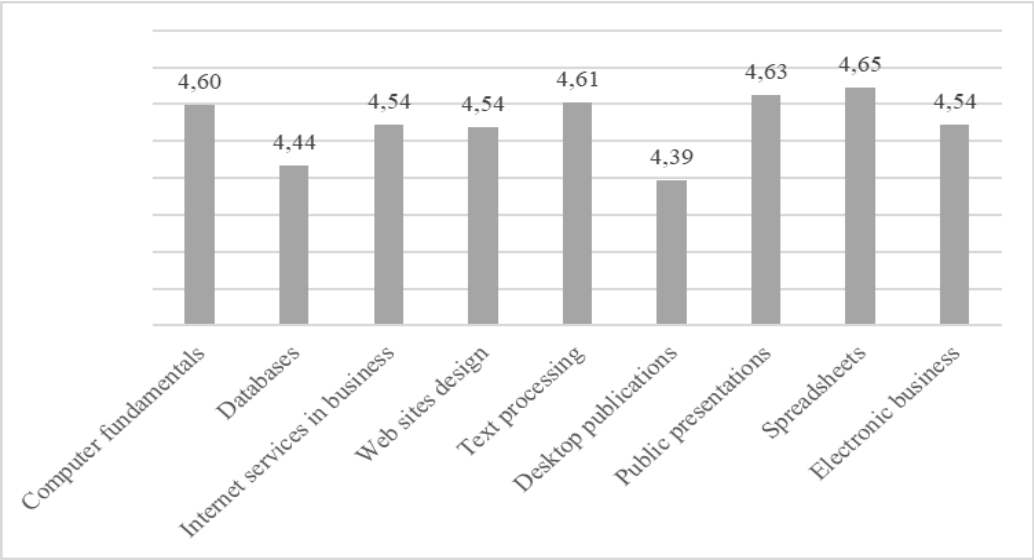


Figure 2. Perceived usefulness of the practical Business Informatics course topics

If one compares the results obtained for the theoretical topics and practical topics, it is clear that students of the Generation Z prefer to learn practical topics and perceive them as more useful than theoretical ones. This finding can be explained with the previously stated theory indicating that Generation Z students have attention disorder [1], [3], [14]. Since most of the theoretical topics are being taught in an old fashion ex cathedra way, students of the Generation Z can easily be distracted by available personal technology during that kind of lecture since they are, in most cases, not actively involved into the class. On the other hand, in case of practical topics, students are actively involved in solving business problems using ICT and therefore, perceive those topics more useful. Hence, it could be concluded that it is important to actively involve students of the Generation Z into the learning process and to put more emphasize on the practical part of the Business Informatics course than on the theoretical one.

Conclusion

This paper presented the research results of a survey conducted among the students of the first year of Business economics and Economics university study programme at the Faculty of Economics & Business, University of Zagreb, Croatia. Named students are considered to be members of the Generation Z, characterized by the rapid technology development and advanced digital technology surroundings from a very young age. The research results revealed that there are statistically significant differences between perceived level of digital literacy of the surveyed students, indicating that, although they have been constantly surrounded by digital technologies, education on the ICT topics is still needed in order to achieve higher levels of digital literacy. Also, the research revealed that students think that ICT can increase interestingness of teaching, see the potential of ICT usage for learning and would like more ICT to be used by their teachers in the educational process, but do not perceive that ICT

UDK 316.774:004-057.875; DOI 10.2507/IJVA.5.1.2.56

can motivate them to learn or increase their learning skills. Finally, this study also revealed that students of the Generation Z prefer to learn practical ICT topics by being actively involved into the lectures in terms of problem solving than to listen and learn theoretical ICT topics.

The limitation of this study lies in unequal sample sizes for two different stages of survey research. In other words, one cannot be sure if the same students have been answering both surveys since there has not been any kind of tracking information involved in the first survey. In that sense, further research should ensure that the sample for both before and after the course surveys is the same, i.e. that same students answer the survey at the beginning of the course and later at the end of it. Therefore, the researchers should assign codes for each participant in the first survey which they should enter again in the second one. That way the research would be strengthen. Another limitation of the study is the fact that the attitudes towards ICT learning are being examined only before the course and not afterwards so it is not possible to investigate if there is a connection between students' attitudes towards ICT learning and the actual outcome after taking the course. This limitation could also be overcome in the further research by the inclusion of the named questions into the survey after the course. The generalisation of the findings could also be limited since the research is conducted only in one country. Therefore, in order to strengthen the generalisation of the findings, future research should include respondents from multiple countries. Moreover, further research should include comparison to previous researches on the topic including other generations, as well as conducting a survey on a larger sample of mixed generations so that the results regarding the attitudes towards ICT knowledge could be compared through generations.

References

[1] Berkup, B. S. (2014). Working With Generations X and Y In Generation Z Period: Management of Different Generations in Business Life. Mediterranean Journal of Social Sciences, Vol. 5, No. 19, (August 2014), pp. 218-229, ISSN 2039-2217

[2] Beekman, T. (2011). Fill in the generation gap. Strategic Finance, Vol. 93, No. 3, pp. 15-17.

[3] Arkhipova M.V., Belova E.E., Gavrikova Y.A., Pleskanyuk T.N. and Arkhipov A.N. (2019). Reaching Generation Z. Attitude Toward Technology Among the Newest Generation of School Students. In: Popkova E., Ostrovskaya V. (eds) Perspectives on the Use of New Information and Communication Technology (ICT) in the Modern Economy. ISC 2017. Advances in Intelligent Systems and Computing, vol 726. Springer, Cham, pp. 1026-1032.

[4] Postolov, K., Magdinceva Sopova, M. and Janeska Iliev, A. (2017). E-learning in the hands of generation Y and Z. Poslovna izvrsnost, Vol. 11, No. 2, pp. 107-119.

[5] Pousson J. M. and Myers K. A. (2018). Ignatian Pedagogy as a Frame for Universal Design in College: Meeting Learning Needs of Generation Z, Education Sciences Journal, Vol. 8, No. 4.

[6] Pejić Bach, M., Bosilj Vukšić, V., and Ćurko, K. (1999), Organisation and improvement of teaching practice in informatics, Journal of Information and Organizational Sciences, Vol. 23, No. 1, pp. 23-36.

UDK 316.774:004-057.875; DOI 10.2507/IJVA.5.1.2.56

[7] Strauss W. and Howe N. (1992). Generations: The History of America's Future, 1584 to 2069, William Morrow & Company, ISBN 0-688-11912-3, USA: New York
[8] Bennetts, E and Rademacher, W. E. (1997). After the Boom: The politics of generation X, Rowman & Littlefield Publishers, ISBN 978-0-8476-8359-8, USA: Bostan Way
[9] Neile, H. (2014). The Silent Generation, "The Lucky Few" (Part 3 of 7), Available from:https://www.forbes.com/sites/neilhowe/2014/08/13/the-silent-generation-the-lucky-few-part-3-of-7/#244786432c63 Accessed: 2019-06-01
[10] Carlson, E. (2008). The lucky few: Between the greatest generation and the baby boom. S.l.: Springer.
[11] Zemke, R., Raines, C., & Filipczak, B. (2003). Generations at work: Managing the clash of veterans, boomers, xers, and nexters in your workplace. New York, NY, etc.: AMACOM.
[12] Lancaster, L. C. and Stillman, D. (2002). When Generations Collide. Who They Are. Why They Clash. How to Solve the Generational Puzzle at Work. Collins Business, USA: New York.
[13] Tapscott, D. (1998) Growing Up Digital: The Rise of the Net Generation. McGraw-Hill, USA: New York.
[14] Tapscott, D., (2009). Grown Up Digital How the Net Generation Is Changing Your World, McGraw-Hill.
[15] Jain, V., and Pant, S. (2012). Navigating Generation Y for Effective Mobile Marketing In India: A Conceptual Framework, Mobile Marketing Association IJMM, Vol. 7, No. 3.
[16] Oblinger, D.G., and Oblinger, J.L. (2005). Educating the net generation. EDUCASE, CO: Boulder.
[17] Singh, A.P., & Dangmei, J. (2016). Understanding the generation z: the future workforce. South -Asian Journal of Multidisciplinary Studies, Vol. 3 Issue 3
[18] Levickaite, R. (2010). Generations X, Y, Z: How social networks form the concept of the world without borders (the case of Lithuania). LIMES: Cultural Regionalistics, Vol. 3, No. 2, pp. 170-183.
[19] Bullen, M., Morgan, T. and Qayyum, A. (2011). Digital Learners in Higher Education: Generation is Not the Issue. Canadian Journal of Learning and Technology, Vol. 37, No. 1.
[20] Persada, S. F., Miraja, B. A., and Nadlifatin, R. (2019). Understanding the Generation Z Behavior on D-Learning: A Unified Theory of Acceptance and Use of Technology (UTAUT) Approach. I-JET, Vol. 14, No. 5.
[21] Greydanus D. E. and Greydanus M. M. (2012). Internet use, misuse, and addiction in adolescents: current issues and challenges, Int J Adolesc Med Health, Vol. 24, No. 4, pp. 283-289.
[22] Lorenzo, G. and Dziuban, C. (2006). Ensuring the Net Generation is Net Savvy. Educause Learn. Initiative 2006, Vol. 2, pp. 1-19.
[23] Salubi, O., Ondari-Okemwa, E. and Nekhwevha, F. (2018). Utilisation of library information resources among generation Z students: Facts and fiction. Publications, Vol. 6, No. 2.
[24] Barnes, K., Marateo, R. C. and Ferris, S. P. (2007). Teaching and Learning with the Net Generation, Innovate: Journal of Online Education, Vol. 3, No. 4.
[25] Kumar Basak, S., Wotto, M., & Bélanger, P. (2018). E-learning, M-learning and D-learning: Conceptual definition and comparative analysis. E-

UDK 316.774:004-057.875; DOI 10.2507/IJVA.5.1.2.56

Learning and Digital Media, Vol. 15, No. 4, pp. 191-216.
[26] St. Martin, G. (2014). Generation Z and the Future of Higher Education. Available from: https://news.northeastern.edu/2014/11/19/generation-z-and-the-future-of-higher-education/, Accessed: 2019-06-02
[27] Ng, W. (2012). Can we teach digital natives digital literacy?. Computers & education, Vol. 59, No. 3, pp. 1065-1078.

PHOTO 2.
Look through Passage
PHOTO BY: JOSIP MESIĆ

Category: preliminary communication

Merin, Thomas [1]
Francis, Alteena Maria [2]
Ramanathan, Hareesh N. [3]

Multidimensional Evaluation of Mutual Funds Using Performance Ratios: A Critical Examination of Technology Sector Mutual Funds in India

Abstract:

Over the years, a number of performance indicators have been developed and used to assess the performance of mutual funds. The choice of these performance measures completely rests on the perception of the investor as to which measure conveys the information sought after by the investor and which information the investor considers would be meaningful in deciding the fate of his investments. Objective & Methodology: To evaluate the risk and return of selected technology sector mutual funds and to analyse the composite information conveyed by Sharpe's ratio, Treynor's ratio, upside and downside capture ratios.

Results & Discussion: When the funds were analysed using Sharpe ratio, Treynor's ratio upside capture ratio and downside capture ratio, the funds that performed the best in consideration to a particular measure may not be termed best when analysed with another performance gauges stressing on the fact that all the ratios should be analysed with an integrated perspective to derive any underlying information on the performance of the fund and that the choice of the benchmark which stands as a basis to assess performance of the fund is crucial.

Keywords:

Mutual funds; sharpe ratio; Treynor's ratio; upside capture ratio; downside capture ratio

Author´s data:

[1] Assistant Professor, Department of Management Studies, Toc H Institute of Science & Technology, Kochi, Kerala, India, merinthomas@tistcochin.edu.in
[2] Research Scholar, Department of Management Studies, Toc H Institute of Science & Technology, Kochi, Kerala, India
[3] Professor and Head, Department of Management Studies, Toc H Institute of Science & Technology, Kochi, Kerala, India, hareeshramanathan@tistcochin.edu.in

UDK 004:330.1(540); DOI 10.2507/IJVA.5.1.3.57

VALLIS AUREA

Introduction

A rational individual has a plethora of investment avenues available. Investment in gold, real estate, shares of companies are some of the most sought after investment options. The quantum of money available for investment and the risk taking aptitude and expectation on return of investment vary among individuals. Of the available investment opportunities, mutual fund is one of the best options that give an investor a varied variety of choices - with regard to amount of money that can put aside for an investment, as schemes such as systematic investment plans provide opportunity for small investors to those who have a huge amount for investment, the different types of funds like debt funds, growth funds, balanced funds etc., help an investor choose on the basis on one's risk appetite, funds like sectorial funds/ index funds etc, provide a choice to invest in sectors they assess have greater prospects or help in investing in a more diversified portfolio.

Over the years, a number of performance indicators have been developed and used to assess the performance of mutual funds. The choice of these performance measures completely rests on the perception of the investor as to which measure conveys the information sought after by the investor and which information the investor considers would be meaningful in deciding the fate of his investments. The objective of the study is (i) to evaluate the performance of selected technology sector mutual funds and by studying the risk and return of various categories of funds of all the asset management companies in India belonging to technology sector on basis of their Net Asset Value(NAV) and (ii) To analyse the composite information conveyed by evaluation criteria's like Sharpe's ratio, Treynor's ratio, upside capture ratio and downside capture ratio.

Review of Previous Research

[1] examines the existing and prospective mutual fund companies institutional and individual investors, researchers and policy makers to get an idea of the nature of relationship between the investment styles and performance of the mutual funds in the Indian context, which will have broader implications for developing competitive strategies and to develop appropriate policies conducive to the healthy growth of Indian Mutual Funds by conducting a risk adjusted performance evaluation of Indian mutual fund schemes. The study clearly brings out the fact that the most of the Growth plans (16 out of 21, approximately 76%) are better than Dividend plans in terms of superior returns and in terms of risk 18 out of 21 Growth plans had lesser risk (approximately 86%) had lesser risk and in terms of risk per unit return 16 out of 21 Dividend plans had higher coefficient of variation (approximately 76%) than Growth plans. [4] attempt to analyse various mutual fund schemes pertaining to technology sector. In this context an attempt has been made by the researcher to examine the growth, risk-return pattern of the mutual fund industry with regard to sector mutual funds. Thus, the study examined entire technology mutual funds over a period of 05 years from 2008-09 to 2012-13.Accordingly, funds have been ranked by taking into account their performance measures using Beta, Sharpe and Treynor's Index. Thus, a fund that scored the highest of the average of the said parameters has been ranked as the best and same method has

UDK 004:330.1(540); DOI 10.2507/IJVA.5.1.3.57

been adopted in ranking the rest of the funds. From the study conducted it can be inferred that IT sector funds at present have lost their charm and past glory probably due to technology meltdown and IT sector may be at its elastic end point which warrants IT companies to focus on vortex of IT business so as to redefine, rethink their business. Results of the study which strongly refute established view point that IT assures better return.

[3] conducted an empirical investigation on the performance of mutual funds schemes and the main purpose of the study is to identify which of the month and year schemes provided highest return and minimize the risk in the technology sector funds. The study was mainly intended to analyse the performance of Indian mutual funds based on the performance of close-end and open-end mutual fund schemes over the period 2002-03 to 2012-13 financial year. The researcher has adopted Price Earnings ratio, Book Price Ratio, Return and Net Asset value and Assets Under Management. Further take to considering the performance index model. Sharpe performance evaluation model, Jenson model, Treynors performance model . The study constructs portfolio with maximum Sharpe ratios from an equity diversified schemes and income, balance and index to identified the selection of funds.

The study conducted by [2] attempts to analyse the growth and performance of Equity and Hybrid Schemes of 10 Mutual funds from 2002-03 to 2010-11. It also studies the perception of 200 mutual fund investors in Punjab with the help of a pre-tested questionnaire. The analysis of secondary data reveals that majority of mutual fund schemes whether they belong to growth schemes or balanced schemes have medium risk. All the growth schemes of IT sector schemes of mutual funds have performed well above the benchmark indices as compared to balanced fund schemes of selected mutual funds. On the basis of both Sharpe and Treynor measures, majority of the schemes have outperformed the benchmark indices from 20012-13 to 20015-16.

A study conducted by [5] mainly focused on conducting an empirical analysis and the interpretation of secondary and primary data for performance evaluation of sectoral mutual fund schemes with various tools like Sharpe ratio, Treynor Ratio, Jensen Alpha model, Fama's decomposition model, coefficient of correlation, rank correlation and factor analysis. It also analysed the performance of dedicated infrastructure funds vis-a-vis the diversified equity fund and also examines the performances of DIF s and diversified equity fund over Bull and Bear phases. He concluded the study that at the time of bull phase technology sector funds perform better than any other schemes of funds and return and risk is high for the technology scheme funds.

From the study conducted by [6] evaluates the performance of Indian Mutual Funds, which is carried out through relative performance index, risk-return analysis, Treynor's ratio, Sharp's ratio, Sharp's measure, Jensen's measure, and Fama's measure. The data used is daily closing NAVs. In his study finding he suggests that the investment in SBI contra funds with moderately high risk perform well in market.

Methodology

UDK 004:330.1(540); DOI 10.2507/IJVA.5.1.3.57

For this study, top ten technology sector growth funds that were existent in the last three financial years have been selected for the purpose of evaluation. The monthly closing Net Asset Value (NAVs) for the period a period of three years ending on 30th April 2019 have been extracted from the database of Association of Mutual Funds in India (AMFI) and the Standard and Poor's Bombay Stock Exchange Information Technology Index (S&P BSE IT index) of the Bombay Stock Exchange, India has been chosen as the benchmark index. Then, the total return, alpha - a measure of the difference between a fund's actual returns and its expected performance, given its level of risk as measured by beta, standard deviation and beta were calculated for the respective schemes to gather an idea of their actual earnings, risk and volatility respectively. Alpha and beta are calculated by least squared regression of the fund's excess return (or fund's return over treasury bills chosen as the risk free interest rate) and excess returns of the S&P BSE IT index. The standard deviation was calculated using the trailing monthly returns for a period of three years and all the monthly standard deviations were annualised.

The performance of various mutual fund schemes offered by the different Asset Management Companies (AMC) were evaluated and measured using relative performance index like, Treynor's Ratio, Sharpe Ratio, Upside ratio and downside ratio as follows:

Treynor's Ratio

[8] Treynor was the first researcher to develop a composite measure of portfolio performance. The ratio measures the portfolio's efficiency using the relationship between risk adjusted return and the market risk, beta.

$$Treynor's\ Ratio\ (T) = \frac{Rp - Rf}{\beta p}$$

Where, Rp is the return of the portfolio, Rf - the risk free return and βp is the systematic risk of the portfolio.

Whenever Rp is greater than Rf and βp is positive, a larger T value indicates a better portfolio for all investors. The following two cases would reflect a negative T value: when Rp is less than Rf implying a poor portfolio performance or when βp is negative implying that the portfolio and the market are inversely proportional.

Sharpe Ratio

[7] William Sharpe developed the Sharpe ratio for calculating risk adjusted returns and takes into consideration the excess returns of the portfolio and the total risk of the portfolio. It helps to identify if a portfolio's excess returns are due to a better investment decision or due to a component of additional risk. The Sharpe ratio can be as

$$Sharpe\ ratio = \frac{Rp - Rf}{\sigma}$$

Where,Rp is the return of the portfolio, Rf - the risk free return and σ is the standard deviation of portfolio returns. In the study, it is calculated dividing a fund's annualized excess returns over the risk-free rate by its annualized standard deviation.

The ratio helps to directly analyse how much risk each fund had to bear to earn an excess return over the risk free interest rate.

UDK 004:330.1(540); DOI 10.2507/IJVA.5.1.3.57

Upside Capture Ratio

The ratio evaluates on how mutual fund performed relative to the index when the index had risen. It indicates the investment manager's overall performance in the up-markets. It is calculated as

$$Upside\ Capture\ ratio = \frac{Manager's\ Returns}{Index\ Returns} \times 100$$

If the value of the upmarket ratio is more than 100, the investment manager has outperformed the index during an up market. In the study, the ratio is calculated by taking the fund's monthly return during the periods of positive benchmark return divided by the benchmark return of the same month and then calculating the geometric average for the fund and index return during the up months for a period of three years.

Downside Capture Ratio

The ratio evaluates on how mutual fund performed relative to the index when the index had fallen. It indicates the investment manager's overall performance in the down-markets. It is calculated as

$$Downside\ Capture\ ratio = \frac{Manager's\ Returns}{Index\ Returns} \times 100$$

If the value of the downside capture ratio is less than 100, the investment manager has outperformed or loss less than the index during a down market. If the ratio is negative, it reflects that the fund has generated positive returns when the benchmark declined. In the study, the ratio is calculated by taking the fund's monthly return during the periods of negative benchmark return divided by the benchmark return of the same month and then calculating the geometric average for the fund and index return during the down months for a period of three years.

On calculating the above ratios, the funds are categorised as top performing, moderately performing and least performing funds based on percentile. The top 30 percentile of funds are classified as top performing, the next 30 percentile of funds to be moderately performing and the last 40 percentile to be least performing and are colour coded to give a visual view of the funds' performance.

Results and Discussion

The top ten technology funds were selected to study the composite information reflected by performance ratios. The alpha which is a measure of the difference between a fund's actual returns and its expected performance, given its level of risk as measured by beta and standard deviation were calculated for the respective schemes to gather an idea of their actual earnings, risk and volatility respectively. Further the Sharpe ratio, Treynor Ratio, Upside and down side capture ratios were calculated to compare the performance of the funds.

UDK 004:330.1(540); DOI 10.2507/IJVA.5.1.3.57

Fund	Total return (%)	Alpha	Beta	Standard Deviation	Sharpe Ratio	Treynor's Ratio	Upside ratio	Downside ratio
A	16.88	4.44	0.91	16.8	0.81	14.953846	92	68
B	14.88	2.71	0.91	16.76	0.71	13.076484	89	73
C	15.72	5.17	0.69	13.46	0.9	17.556522	76	47
D	14.71	4.31	0.69	13.43	0.84	16.349565	75	49
E	14.24	3.87	0.68	12.97	0.83	15.831029	76	53
F	13.27	3.03	0.68	12.93	0.77	14.641324	74	55
G	14.31	3.63	0.72	13.15	0.83	15.159028	76	53
H	13.21	2.67	0.71	13.13	0.75	13.869718	74	56
I	14.57	4.87	0.59	11.05	0.98	18.354237	68	39
J	13.88	4.27	0.59	11.04	0.93	17.402034	67	40

Table 1. Consolidated values for the period 2016-2019

Inference: In table 1, it is seen that fund A has a total return of 16.88% and alpha is 4.44 implies that fund produced 4.44% more than what the beta would predict. The beta of the fund is 0.91 which is very close to the market. The standard deviation of the fund is 16.8% reflecting that 68 percentage of time the funds mean returns varied with tolerance of ± 16.8% from the mean returns. The Sharpe ratio for fund A is 0.81 shows the risk adjusted performance of the fund. The higher the Sharpe ratio, the better the risk adjusted performance. The Treynor ratio of 14.95 implies how well the investment has compensated the investor for the given level of risk. The higher the Treynor ratio, the better the compensation to the investor. An upside capture ratio of 92 implies the fund has not generally beat the market while there was an upmarket while a downside capture ratio of 68 implies the fund had lost less compared to benchmark in a downside market. A higher upside ratio and a low downside capture ratio is advantageous to the investor.

The above measures were analysed and the selected funds were classified on the basis on each measure as best performing, moderately performing and least performing.

Fund	Sharpe Ratio	Treynor's Ratio	Upside ratio	Downside ratio	Rank
C	0.900	17.557	76	47	1
I	0.980	18.354	68	39	2
J	0.930	17.402	67	40	2
E	0.830	15.831	76	53	3
G	0.830	15.159	76	53	3
D	0.840	16.350	75	49	4
A	0.810	14.954	92	68	5
B	0.710	13.076	89	73	5
F	0.770	14.641	74	55	6
H	0.750	13.870	74	56	6

Table 2. Classification of Funds based on performance

In table 2, the funds that have performed the best have been coded green, the moderately performing

UDK 004:330.1(540); DOI 10.2507/IJVA.5.1.3.57

funds have been coded yellow and the least performing have been coded red. Here, the top 30 percentile of funds are classified as top performing, the next 30 percentile of funds to be moderately performing and the last 40 percentile to be least performing. This colour coded classification would yield information on the best performing funds as per information provided by each ratio. A checkered pattern would help to unearth additional information on riskiness or opportunity for returns underlying the fund categories. Now the funds are ranked by providing equal weightage to performance measures considered in the study.

From the table, it can be noted that as per Sharpe's ratio and Treynor's ratio, the best performing are funds C, I and J. But, while considering the upside capture ratios, funds I,J seem to be performing the least compared to the funds selected. These funds have performed less attractively during the up markets but have been seen as the best performing during the down markets. It is seen that fund C has fallen in the top 30 percentile considering all factors chosen in the study and hence ranked '1'.

But the choice of fund C may not be termed as best as the choice may vary for investors who have different risk appetite. Hence, on integrating all the measures and classifying the measures, an investor could make a more informed decision and get a more vivid outlook on what to expect from his investment decision

The strength of measures like upside and downside capture ratios relies on the returns of the benchmark index stressing on the importance of wisely choosing a benchmark. The benchmark chosen should reflect the investor's perception of the market and expected returns, else the analysis of the ratios would not yield necessary insights for an investor.

Conclusion

This paper studies the relative information reflected by major ratios used in the analysis of performance of mutual funds. It is seen that when the funds were analysed using Sharpe ratio, Treynor's ratio, upside and downside capture ratios. The investors can make more informed choices by gaining a composite view of all the measures enabling him reduce the ambiguity in the expected returns. All the ratios should be analysed with an integrated perspective to derive any underlying information that plays a prominent role in the assessment of mutual fund performance.

From the analysis, it may also be concluded that the choice of the bench mark return plays a prominent role in the assessment of mutual fund performance. A wrong benchmark would lend a false view of the comparative risk and returns on the performance of the fund and hence the choice of the benchmark is crucial.

References

[1] Chauhan, S. S. (2011). *An Empirical Study on Risk Adjusted Performance Evaluation of Indian Mutual Funds Schemes.* Indore: Devi Ahilya Vishwavidyalaya.

[2] Kumar, R. (2017). *Performance Evaluation of Mutual Funds in India: a Study of Equity and Hybrid Schemes.* Punjab: Punjabi University.

[3] Mangawa, P. (1991). *Performance Evaluation of Mutual Funds in India Comparative Study of Close End and Open End Mutual Fund Schemes.* Rajasthan: University of Rajasthan , Department of Economic Administration and Financial Management.

[4] Maruti, S., & Shivaji, W. (2013). Sector Mutual Funds - A Study on Performance Measurement and Evaluation with Special Reference to Technology

UDK 004:330.1(540); DOI 10.2507/IJVA.5.1.3.57

Funds. *International Journal of Economics Commerce and Research (IJECR)*.
[5] Mittal, A. (2011). *Comparative Analysis of Sectoral Mutual Fund Schemes with Reference to Uttarakhand.* Dehradun: University of Petroleum and Energy Studies (UPES).
[6] Prajapati, K. P., & Patel, M. K. (2012). Comparitive Study on Performance Evalution of MutualL Fund Schemes of Indian Companies. *Journal of Arts, Science & Commerce*.
[7] Sharpe, W. F. (1966). "Mutual Fund Performance. *Journal of Business*.
[8] Treynor, J. L. (1965). How to Rate Management of Investment Funds. *Harvard Business Review*.

UDK 004:330.1(540); DOI 10.2507/IJVA.5.1.3.57

Category: preliminary communication

Gutić Martinčić, Sanja [1]

Organizational Factors of Career Management Employed in the Transition Economy

Abstract:

The aim of this research was to determine which organizational factors have an impact on the realization of individual employee career plans. The sample was of a quotient, random selection of the respondent, of the size of 60 examinees (n = 60). It was formed from 20 large organizations from all over Croatia. The survey was conducted by direct survey. The regression analysis method was applied. The regression equation of organizational factors that affects the career development of employees is calculated and determined.

Of the six independent variables included, it was established that the most impacted on the career plan of the employees is the analysis and enrichment of the work, followed by psychological monitoring. The lowest coefficient of regression has been shown by career workshops and career charts.

Keywords:

Employee careers; organizational factors

Author´s data:

[1] Effectus, High School of finance and law, Zagreb, J.F. Kennedy square 2, e-mail: gutic.sanja@gmail.com

UDK 005.966-057.16; DOI 10.2507/IJVA.5.1.4.58

Introduction

In Human Resources Management, the Career management segment today is one of the key points. The realization of individual career plans employees is not only focused on the personal aspects, interests and contents of each employee, but also requires organizational support. Without organizational support, it is not realistic to realize a planned career. Employees successfully achieving their career plans achieve a higher degree of job satisfaction, greater productivity, creativity and innovation, loyalty to the organization, more responsible for doing jobs, avoiding better stress at work, etc. It is therefore an interest of all organizations that within the human resources management system potentials are applied in the best way to the management of employees' careers.

So far, a lot of works have been published, which outlined the methods, and the ways in which management seeks to help employees achieve the greatest satisfaction in achieving their careers. It is constantly emphasized and emphasizes that the role and support of the organization is irreplaceable in that. One of the fundamental characteristics of this is that these contributions are mainly contributed by the results generated in the developed human capital markets. By doing so, it reduces their applicative dimension in transition economies.

It is not unknown, and it is unexplored that organizations have a significant influence on their employees' careers. What is still largely unknown, and thus unexplored, are all the tools available to managers for successful career management.

This paper seeks to highlight organizational content and factors that can have a positive impact on the realization of individual career plans of employees in organizations in transition economies. It is believed that the research results that are being presented will provide a creative incentive for human resources management in these organizations to give greater attention to the careers of employees and direct their activities in this direction. One of the perhaps basic issues that will be encountered during the research is that the concept itself, and thus the model of human resources management in the transitional economy, is underdeveloped, researched and therefore reduced efficiently.

Career success

Career development and career management are measured by success. What is implicit in itself is: what is success in your career? There exist in the theory and practice of career management different opinions about it [2]. Career success is first and foremost individually colored and it is not possible to talk about the unique criteria and benchmarks that would be worth for each individual career. To evaluate career success, it is possible to use several criteria [12]:

a) Inner feelings related to employee satisfaction and the perception of this satisfaction,
b) The employee's life balance and achievement and the balance that consists of the balance between his work obligations and his non-work obligations,

UDK 005.966-057.16; DOI 10.2507/IJVA.5.1.4.58

c) The level of achievement of the realization of the life goals of the employees through the work and the organizations in which they are moving,
d) The level of fulfillment and the efforts made regarding the realization of the established career development plan, the correction of the plan,
e) Autonomy in work and freedom of independent decision-making in the work process,
f) The character of the working environment and the degree of employee identification with the organization and the working group,
g) Opportunities for selecting jobs and work tasks that are in line with the available knowledge and skills that the employee possesses,
h) Rank and status of employees in the working group and organization

Despite the developed career metrics and career achievements, some of these categories are still very difficult to quantify and objectively measure. Four approaches to looking at career performance [7]:

1. Individual approach,
2. Structural approach,
3. Behavioral approach,
4. Contemporary approach.

Individual approach comes from the theory of human capital. This approach simplifies the focus of career tracking metrics observed through individuals within the organization. They invest most in career development in their education, training, gaining experience and expect that they will be adequately rewarded based on their efforts and investments. According to this approach, career success is directly proportional to the quality of human capital that the individual brings to the labor market [6].

The structural approach is based on the assumption that there are a number of objective, different structural features that present limitations to the individual in the development of his career [8]. The size of the organization or its activity, or the organizational structure, are one of the structural factors. Larger organizations, for example, unlike smaller, have more structured and advanced organizational levels and opportunities and allow their employees to give more opportunities and efforts to advance in this organizational structure and thus in their career. In addition to the stated structural features, the structural approaches often include the frequency of employee advancement and the quality of the system of promotion of human resources in organizations [8].

A behavioral approach implies that employees have full control over their choice and career development. By doing so, they can assess their positions, roles and chances in organizations in the direction of their career development. The basic emphasis of this approach is that employees should permanently take proactive roles in developing their own career. This role can be realized using different interpersonal and intrapersonal strategies such as: self-initiation, identification, imitation etc. [2]. The main limitation in this approach is the existence of a perfect labor market and its functioning [11]. Within this perfect market, individuals can realize their career and measure success in their career.

UDK 005.966-057.16; DOI 10.2507/IJVA.5.1.4.58

Contemporary career approaches are based on a cumulative outcomes in career development resulting from a long period of individual behavior. There are three approaches to the modern approach: the concept of an unlimited or boundless career, the concept of a protean career and the concept of an intelligent career [3].

Organizations factors in career employees' management

Human career is realized solely within organizational systems and differs from organization to organization. Organizations determine employee profiles, job content, job performance regimes, goals to be achieved, skills and skills that employees need to have successfully accomplished their tasks.

Seligman comes to the knowledge that people are advancing in their careers when they are able to develop positive emotions and emotional relationships, then positive psychosocial interactions in their working group, and a positive engagement in the organization [12]. He argues that due to the absence of these three components, there is a shortage of career development. The emphasis in this approach is mainly on the aspects of an individual employee, and not on aspects and content of an organization in supporting the development of each member's career. Ryan and Deci, present the research results that link the career development with the autonomy of the employees, their competencies during the work, and the connection of the work operations and the information they need to perform the job successfully [11]. They point to the need and more importantly try to promote the concept of intrinsic motivation of employees as significant support in career development. Although this approach has a shift towards Seligman's standpoint, a number of other factors that determine the success of employee careers, with which organizations can influence it, remain unclear. Valey brings the results of extensive psychological observations and research and points out that they need an effective career [16]: self-awareness; self-confidence, cognitive knowledge, interpersonal competence; skills in achieving identity, communication skills; skills in running teams and teams. Though the great role and significance of these, as well as other numerous psychological determinants in career achievement, is not a real career success, just focus on them.

Perhaps one of the most important contributions to the identification of organizational factors in the realization of the career of employees is brought by Arthur and Rousseau. They claim to be [1]:

a) Self-employment tools for employment. Include: career planning workshops, self-managing career workshops, retirement retirement workshops, computer software and its implications in career management.

b) Assessment of organizational human potential. Includes career promotion, psychological monitoring, assessment centers, interviews, job analysis.

c) The internal labor market, which includes: career manuals, career charts, resource center, information support.

d) Individual employment counseling involving: managers, senior career advisors,

UDK 005.966-057.16; DOI 10.2507/IJVA.5.1.4.58

human resource center staff, specialized external consultants.

e) Business analysis systems, including informal testing, job vacancy advertising, job auditing, rotation staffing, internal staffing systems.

f) Development programs that include: enrichment and design of jobs, job changes, in-house training, external seminars and workshops, training costs reimbursement, training of career management supervisors, dual career programs, mentoring system, employee orientation.

Although this is a well-structured presentation, it is not realistic to consider that there are not many other organizational factors that can affect the realization of the career of employees.

Based on this systematization of organizational factors that assist in the realization of the career of employees, the following six factors are empirically investigated in the observed organizations:

1. Career workshops (RpK), [15]
2. Career promotion (Pro), [6]
3. Psychological tracking (Psi), [8]
4. Analysis and enrichment of jobs (Apo), [10]
5. Career rankings (Ska), [13]
6. Revision and staffing rotation (Rev), [17]

Methodology

Target

The basic and sole objective of the research is to identify which organizational factors and to what extent they have an impact on the realization of individual employee care plans.

Hypothesis

The following basic hypothesis is defined in accordance with the set goal:

Ho - Successful realization of individual employee career plans depends on multiple organizational factors.

Sample

The sample was quotient, random selection of the respondent. The sample size was 60 (n = 60). It was formed from 20 large organizations from across Croatia, random selection. Only those organizations that have confirmed that they have a well established and developed Human resources management center are involved.

The sample did not include respondents with less than 10 years of work experience, as well as subjects older than 60 years of age. Also, no respondents who previously stated that they did not make a clear and understandable career plan or did not remember the elements of that plan were involved.

It is assumed that inclusion of less than ten years of work experience will not yield reliable results because they may not objectively offer valid answers to their career performance (career in the initial stage) and compare the same with the career plan [10]. No respondents older than 60 are involved because it is questionable how much they would be interested in participating in this survey (drop in interest, retirement preparation, end of career) [10].

International Journal - VALLIS AUREA • Volume 5 • Number 1 • Croatia, June 2019
UDK 005.966-057.16; DOI 10.2507/IJVA.5.1.4.58

Respondents

The respondents were employees in various, large organizations from all over Croatia. 50% of respondents were men and 50% women, with 50% of middle class employees and 50% of high class employees.

Test instruments

The satisfaction of the satisfaction with the career accomplished was based on the questionnaire on satisfaction with the career realized [14]. The questionnaire was used in its entirety in an unaltered original form. Levels of satisfaction: completely dissatisfied (1), satisfied (2), completely satisfied (3).

Dependent variables were offered to respondents at five levels: it did not affect my career (1); very little has affected (2); influenced my career (3), greatly influenced my career (4), most influenced my career (5).

Variables

The independent variable (Y) is the realization of the career plan of employees, and the dependent variables are:

1. Career workshops (Rpk),
2. Careers promotion (Pro),
3. Psychological tracking (Psi),
4. Business analysis and enrichment (Apo),
5. Career rankings (Ska),
6. Revision and staffing rotation (Rev),

Other possible variables as systematically exposed to Arthur and Rosseau could not be included since they were not in career management in the observed organizations.

Interviewing

The survey was conducted by a direct survey during September-December 2018. There was a completely anonymous character about which respondents were notified before the start of the test. Surveys were conducted by interviewers prepared for this task.

Methods

The regression analysis method according to the equation was applied:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \varepsilon$$

or shown in the model of this research:

$$Y = \beta_0 + \beta_1 Rpk + \beta_2 Pro + \beta_3 Psi + \beta_4 Apo + \beta_5 Ska + \beta_6 Rev + \varepsilon$$

Coefficients of regression were estimated by the least squares method [5]:

$$RSK = \sum \varepsilon_1^2 = \sum (Y_1 - \hat{Y}_1)^2$$

The F-test for determining the determination coefficient (R) and the t-test for the significance of the determinants were used [9]:

$$_{N-k} \approx \frac{\beta_1 - 0}{S_{\beta j}}$$

Variation autocorrelation (DW) was performed using the Durbin-Watson test [4]:

$$DW = \frac{\sum_{t=2}^{T} (\varepsilon_t - \varepsilon_{t-1})^2}{\sum_{t=1}^{T} \varepsilon_t^2}$$

UDK 005.966-057.16; DOI 10.2507/IJVA.5.1.4.58

Limitations

Observed organizations have largely had developed forms of human resources management, but within them are still underdeveloped forms and management content of the career of employees. There was also a considerable difficulty in the non-homogeneous structure of career management model of employees within organizations [6].

Certainly, for a larger study, it would be good to form larger size samples, preferably with multiple layers of choice. However, given the resource potential and the objective of this research, it was not possible.

Data processing

For the statistical analysis of the data collected, the SPSS for Windows software version (version 20.0, SPSS Inc., Chicago, Illinois, USA) was used.

The results

The following regression equation of organizational factors influencing the career development of employees has been calculated and determined:

$$Y = 7{,}425 - 0{,}1508\ Rpk + 0{,}3511\ Pro + 0{,}5279\ Psi - 0{,}6025\ Apo + 0{,}2714\ Ska + 0{,}4921\ Rev$$

t	2,52	4,03	1,84	7,49	3,38	9,01	5,22

$R^2 = 0{,}86$ $F = 8249$ $DW = 1{,}87$

From the equation there is an approximate and possible conclusion that the organizational factors involved in the realization of the career plan employed by the perceived flow of the respondents have the most influence on the analysis and enrichment of the jobs and then the psychological monitoring. The lowest coefficient of regression shows career workshops and career rankings.

Employees, in fact, experience that their career performance is most affected by the various activities that management takes in the field of monitoring work, analysis, and adding new content to their jobs. Also, various forms of psychological assistance, advice and suggestions during the job are considered to have a significant influence on the course and career achievement.

It is not a satisfying role for the existence and functioning of a career workshop that can have a negative impact on career achievement in the long run, as employees do not acquire the necessary personal knowledge through the training sessions within the workshops and the interaction of knowledge about managing their own career. Thus, in a certain sense, the role and significance of individual efforts of every employee to care for their career is undermined, which can negatively affect the success of a career. Likewise, the low-ranking career rankings point to the possible conclusion that observed organizations have not sufficiently developed their organizational structure within which there are no clearly visible layers of hierarchical upsets employed during their career or are not clearly visible and available to employees.

UDK 005.966-057.16; DOI 10.2507/IJVA.5.1.4.58

A relatively high determination coefficient suggests that 86% variance of the dependent variables is interpreted with the six independent variables included. Thus, only 14% remained untroubled, which would probably be further reduced by the possibility of inclusion of any of the possible organizational variables that Arthur and Rousseau systematically exhibit [1].

The T values, shown at each regression coefficient, indicate that all independent variables in the study are statistically significant at the 5% significance level.

The high F value of the regression equation indicates that the determination coefficient is significant. Thus, all six coefficients of regression involved are significantly different from zero. F values do not indicate the possible multicollinarity among the examined variables.

Given the calculated value of the Durbin-Watson test, it is concluded that there is no autocorrelation of the first rank among the observed variables.

Discussion

What is the wisdom and reality of this research?

Since no positive autocorrelation was observed among the observed variables, it was not necessary to determine the established regression model with additional variables. If that was the opposite, it is questionable how much it could be. Namely, the practical and additional variables could not be generated in the observed organizations. Adequate transformations of existing, involved variables would in that case be not only demanding but rather uncertain.

It remains debatable how many other, exogenous, non-involved variables that make up the personal characteristics of each of the respondents (employees outside the organization) affect the overall satisfaction of the respondents with a career. But the answer to that question was not the focus of this research.

It is also questionable how many other, exogenous, non-included variables that make up the personal characteristics of each of the respondents (employees outside the organization) affect the overall satisfaction of the respondents with the career. But the answer to that question was not the focus of this research.

The regression equation presented in this paper is not realistically understood statically, but dynamically. The level of satisfaction of respondents by developing their career is not definitive, but forms and develops during their remaining career. Thus, established organizational factors are changing over time, both quantitatively and qualitatively. Therefore the regression equation could be complemented as:

$$\Delta Y = 7{,}425 - 0{,}1508\ \Delta Rpk + 0{,}3511\ \Delta Pro + 0{,}5279\ \Delta Psi - 0{,}6025\ \Delta Apo + 0{,}2714\ \Delta Ska + 0{,}4921\ \Delta Rev$$

The regression coefficients in this equation are not constant in the duration of the career of employees and should therefore be understood and interpreted.

Possible errors in the regression equation partly derive from the release of other independent variables which, due to situational factors, are not included in the regression model. One of the approaches in reducing or eliminating this possible mistake is through covariant analysis whereby by introducing several apparent variables into a regression model it will be eliminated.

Conclusion

The basic and sole objective of this research was to identify which organizational factors and to what extent they have an impact on the realization of individual employee care plans. Of the six independent variables included, it was established that the performance of the career plan employed by the perceived flows of the respondents most influenced the analysis and enrichment of the work, and then the psychological

UDK 005.966-057.16; DOI 10.2507/IJVA.5.1.4.58

monitoring. The lowest coefficient of regression has been shown by career workshops and career charts. Not a satisfactory part of the existence and functioning of career workshops and career charters.

This suggests a possible conclusion that observed organizations have not sufficiently developed their organizational structure within which there are no clearly visible strata of hierarchical ascents employed during their careers. The inadequate elaboration and application of numerous instruments with which organizations can efficiently manage the career of their employees is typical of the vast majority of organizations in the transition economy. Since it has been confirmed that all six variables included have an impact on the career of employees, it can be accepted that the objective of this research has been successfully implemented. This is a hypothesis related to the purpose of the research.

References

[1] Arthur, M.B. & Rousseau, D.M. (1996). The boundaryless career, Oxford University Press, ISBN 0-19-510014-X, Oxford

[2] Baruch, Y. (2006). Career development in organizations and beyond: Balancing traditional and contemporary viewpoints. Human Resource Management Review, No 16, September, 2006, pp. 125-138, ISSN 1053-4822

[3] Briscoe, J.P., Hall, D.T. & Frantschy DeMuth, R.L. (2006). Protean and boundaryless careers: An empirical exploration, Journal of Vocational Behavior, No 69, June, 2006, pp. 30-48, ISSN 0001-8791

[4] Durbin, J. & Watson, G.S. (1951). Testing for serial correlation in last squares regression II, Biometrica, No 38 (1-2), February, 1951, pp. 159-179, ISSN 14643510

[5] Freedman, D.A.(2009). Statistical Models: Theory and Practice: Cambridge University Press, ISBN 978-0-521-11243-7, Cambridge, USA

[6] Gattiker, U.E. & Larwood, L. (1986). Subjective career success: A study of managers and support personnel, Journal of Business and Psychology, No2, October, 1986, pp. 78-94, ISSN 1573-353-X

[7] Hall, D.T. (2002). Protean careers in and out of organizations, Sage Publications, ISBN 13:978-0761915478, Thousand Oaks, CA

[8] Mohsin, A., Lengler, J. & Kumar, B. (2013). Exploring the antecedents of intentions to leave the job: The case of luxury hotel staff. International Journal of Hospitality Management, No 35, May, 2002, pp. 48-58, ISSN 0278-4319

[9] Panchenko D. (2006). Statistics for Applications, Section 14, Simple Linear Regression. Massachusetts Institute of Technology, ISBN 16-963-047293305-2, Massachusetts

[10] Reidy, S., Ma, C (2016). How do we create robust internal labor market so that employees can move freely into new roles? Cornell University, ILR School, ISBN 0-11-610428, New York

[11] Ryan, R.M. & Deci, E. L. (2000). Self determination theory and the facilitation of intrinsic motivation, social development , and well.being, Americam Psychology Journal, No 55, April, 2000, pp. 68-79, ISSN 0003-066-X

[12] Seligman, M. (2011). Flourish: A new understanding of happines, well-being and how to achieve them. Nichols Brealey Publishing, ISBN 10-9781439190760, Boston

[13] Swamy, D.R., Nanjundeswarasawamy, T.S. & Tashmi, S. (2015) Quality of work life: Scale development and validation, International Journal of Caring Sciences, Vol.8, November, 2015, pp. 281-304, ISSN 1792-037-X

[14] Swarnalatha, T. (2013). Questionnaire on an empirical analysis of work-life balance, Journal of Organizational Behavior, No 23, June, 2013, pp. 731-748, ISSN 1099-1379

[15] Trofimov, A. & Bondar, Y. (2014). Theoretical relationship between career mobility and

organizational commitment, Fundamental and applied researches in practice and leading scientific schools, Taras Shevchenko National University, Kyiv, Ukraine, No 6, December, 2014, pp.37-61, ISSN 2313-7525
[16] Valey, R.S. (2007). Mental skills training in sport handbook og sport psychology, Tannenbaum, G. & Eklund, R.C., ISBN 8-33084622, New York
[17] Zin, M. (2003). The relation between job rotation practices and employee career development among production workers in Japanese companies in Malaysia, Mediterranean Journal of Social Sciences, No 6 (1), March, 2003, pp.124-143, ISSN 2039-2117

UDK 005.966-057.16; DOI 10.2507/IJVA.5.1.4.58

Category: preliminary communication

Al-Mahmood, Ahmed Wasfi Dhahir [1]
Markovskaya, Natalia [2]

Using Garch Algorithm to Analyze Data in R Language

Abstract:

One of the challenging aspects of conditional heteroskedasticity series is that if we were to plot the correlogram of a series with volatility we might still see what appears to be a realisation of stationary discrete white noise. That is, the volatility itself is hard to detect purely from the correlogram. This is despite the fact that the series is most definitely non-stationary as its variance is not constant in time. So ARCH and GARCH models have become important tools in the analysis of time series data, particularly in financial applications. These models are especially useful when the goal of the study is to analyze and forecast volatility. This paper gives the motivation behind the simplest GARCH model and illustrates its usefulness in examining portfolio risk. So an ARCH (autoregressive conditionally heteroskedasticity) model is a model for the variance of a time series.

ARCH models are used to describe a changing, possibly volatile variance. Although an ARCH model could possibly be used to describe a gradually increasing variance over time, most often it is used in situations in which there may be short periods of increased variation. (Gradually increasing variance connected to a gradually increasing mean level might be better handled by transforming the variable). In this article we will see what is ARCH and GARCH, how it's helpful for analyzing economic and financial data and how to use it in R-Studio.

Keywords:

ARCH; volatility clustering; GARCH; Akaike

Author´s data:

[1] Master Student, Yanka Kupala State University of Grodno (Belarus), Gaspadarchaya St., 23, 230009, Grodno, Belarus
[2] Associate Professor, Yanka Kupala State University of Grodno (Belarus), Gaspadarchaya St., 23, 230009, Grodno, Belarus; e-mail: n.markovskaya@grsu.by

UDK 330.43; DOI 10.2507/IJVA.5.1.5.59

Introduction

The great workhorse of applied econometrics is the least squares model. This is natural because applied econometricians are typically called upon to determine how much one variable will change in response to a change in some other variable. Increasingly however, econometricians are being asked to forecast and analyze the size of the errors of the model. In this case the questions are about volatility and the standard tools have become the ARCH/GARCH models. The basic version of the least squares model assumes that, the expected value of all error terms when squared is the same at any given point. This assumption is called homoscedasticity and it is this assumption that is the focus of ARCH/GARCH models. Data in which the variances of the error terms are not equal, in which the error terms may reasonably be expected to be larger for some points or ranges of the data than for others, are said to suffer from heteroskedasticity. The standard warning is that in the presence of heteroskedasticity, the regression coefficients for an ordinary least squares regression are still unbiased, but the standard errors and confidence intervals estimated by conventional procedures will be too narrow, giving a false sense of precision. Instead of considering this as a problem to be corrected, ARCH and GARCH models treat heteroskedasticity as a variance to be modeled. As a result, not only are the deficiencies of least 3 squares corrected, but a prediction is computed for the variance of each error term. This turns out often to be of interest particularly in finance [1].

Autoregressive conditional heteroskedasticity (ARCH). In econometrics, the autoregressive conditional heteroskedasticity (ARCH) model is a statistical model for time series data that describes the variance of the current error term or innovation as a function of the actual sizes of the previous time periods' error terms, often the variance is related to the squares of the previous innovations. The ARCH model is appropriate when the error variance in a time series follows an autoregressive (AR) model; if an autoregressive moving average (ARMA) model is assumed for the error variance, the model is a generalized autoregressive conditional heteroskedasticity (GARCH) model for forecasting, combining ARIMA and ARCH models could be considered. For instance, a hybrid ARIMA-ARCH model was examined for shipping freight rate forecast [2].

ARCH models are commonly employed in modeling financial time series that exhibit time-varying volatility and volatility clustering, i.e. periods of swings interspersed with periods of relative calm. ARCH-type models are sometimes considered to be in the family of stochastic volatility models, although this is strictly incorrect since at time t the volatility is completely pre-determined (deterministic) given previous values [1].

Volatility clustering. Volatility clustering is the tendency of large changes in prices of financial assets to cluster together, which results in the persistence of these magnitudes of price changes. Another way to describe the phenomenon of volatility clustering is to quote famous scientist-mathematician Benoit Mandelbrot, and define it as the observation that "large changes tend to be followed by large changes and small changes tend to be followed by small changes" when it comes to markets. This phenomenon is observed when there are extended periods of high market volatility or the relative rate at which the price of a financial asset

UDK 330.43; DOI 10.2507/IJVA.5.1.5.59

change, followed by a period of "calm" or low volatility [3].

Volatility clusters the phenomenon of there being periods of relative calm and periods of high volatility is a seemingly universal attribute of market data. There is no universally accepted explanation of it. GARCH (Generalized Autoregressive Conditional Heteroskedasticity) models volatility clustering. It does not explain it. Figure 1 is an example of a Garch model of volatility [4].

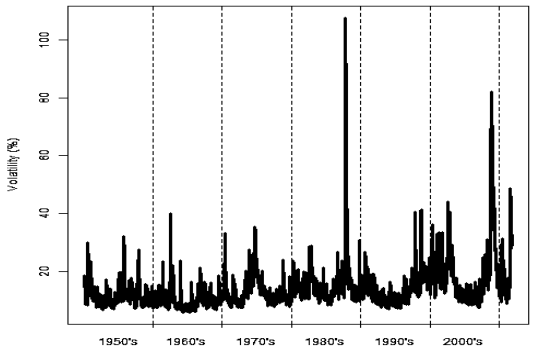


Figure 1- S&P 500 volatility until late 2011 as estimated by a Garch (1, 1) model [4]

The definition of GARCH process. The generalized autoregressive conditional heteroskedasticity (GARCH) process is an econometric term developed in 1982 by Robert F. Engle, an economist and 2003 winner of the Nobel Memorial Prize for Economics, to describe an approach to estimate volatility in financial markets. There are several forms of GARCH modeling. The GARCH process is often preferred by financial modeling professionals because it provides a more real-world context than other forms when trying to predict the prices and rates of financial instruments [5].

Breaking down GARCH Process. Heteroskedasticity describes the irregular pattern of variation of an error term, or variable, in a statistical model. Essentially, where there is heteroskedasticity, observations do not conform to a linear pattern. Instead, they tend to cluster. The result is that the conclusions and predictive value one can draw from the model will not be reliable. GARCH is a statistical model that can be used to analyze a number of different types of financial data, for instance, macroeconomic data. Financial institutions typically use this model to estimate the volatility of returns for stocks, bonds and market indices. They use the resulting information to help determine pricing and judge which assets will potentially provide higher returns, as well as to forecast the returns of current investments to help in their asset allocation, hedging, risk management and portfolio optimization decisions [5].

The general process for a GARCH model involves three steps. The first is to estimate a best-fitting autoregressive model. The second is to compute autocorrelations of the error term. The third step is to test for significance. Two other widely used approaches to estimating and predicting financial volatility are the classic historical volatility (VolSD) method and the exponentially weighted moving average volatility (VolEWMA) method [5].

Example of GARCH Process. GARCH models help to describe financial markets in which volatility can change, becoming more volatile during periods of financial crises or world events and less volatile during periods of relative calm and steady economic growth. On a plot of returns, for example, stock returns may look relatively uniform for the years leading up to a financial crisis such as the one in 2007. In the time period following the onset of a crisis, however, returns may swing wildly from

UDK 330.43; DOI 10.2507/IJVA.5.1.5.59

negative to positive territory. Moreover, the increased volatility may be predictive of volatility going forward. Volatility may then return to levels resembling that of pre-crisis levels or be more uniform going forward. A simple regression model does not account for this variation in volatility exhibited in financial markets and is not representative of the "black swan" events that occur more than one would predict [5].

GARCH Models Best for Asset Returns. GARCH processes differ from homoscedastic models, which assume constant volatility and are used in basic ordinary least squares (OLS) analysis. OLS aims to minimize the deviations between data points and a regression line to fit those points. With asset returns, volatility seems to vary during certain periods of time and depend on past variance, making a homoscedastic model not optimal [5].

GARCH processes, being autoregressive, depend on past squared observations and past variances to model for current variance. GARCH processes are widely used in finance due to their effectiveness in modeling asset returns and inflation. GARCH aims to minimize errors in forecasting by accounting for errors in prior forecasting and, thereby, enhancing the accuracy of ongoing predictions [5].

Estimation of Garch. We are staying with a GARCH (1, 1) model; not because it is the best it certainly is not. We are staying with it because it is the most commonly available, the most commonly used, and sometimes good enough [4]. GARCH models are almost always estimated via maximum likelihood. That turns out to be a very difficult optimization problem. That nastiness is just another aspect of us trying to ask a lot of the data. Assuming that you have enough data that it matters, even the best implementations of GARCH bear watching in terms of the optimization of the likelihood [4].

We know that returns do not have a normal distribution, that they have long tails. It is perfectly reasonable to hypothesize that the long tails are due entirely to GARCH effects, in which case using a normal distribution in the GARCH model would be the right thing to do. However, using the likelihood of a longer tailed distribution turns out to give a better fit (almost always). The t distribution seems to do quite well [4].

The Usefulness of Garch model. GARCH or generalized autoregressive conditional heteroskedasticity models are used to model the conditional volatility of a time series.

Financial markets data often exhibit volatility clustering, where time series show periods of high volatility and periods of low volatility. In fact, with economic and financial data, time-varying volatility is more common than constant volatility, and for accurate modeling of time-varying volatility we use GARCH models. A GARCH (1, 1) is in fact equivalent to an ARCH (infinity) model [6].

Using GARCH model in R-Language. The first step to build our GARCH model is we need to install the "quantmod" package by using the command → install.packages ("quantmod") after pressing enter the package will be installed.

This command is so important to build the model to check how it work we use the command → library ("quantmod") and we press enter we get the result:

UDK 330.43; DOI 10.2507/IJVA.5.1.5.59

```
      Loading required package: xts
Loading required package: zoo
Attaching package: 'zoo'
The following objects are masked from
'package:base':

    as.Date, as.Date.numeric

Loading required package: TTR
Version 0.4-0 included new data
defaults. See ?getSymbols.
Learn from a quantmod author:
https://www.datacamp.com/courses/impor
ting-and-managing-financial-data-in-r
Warning messages:
1: package 'quantmod' was built under R
version 3.5.2
2: package 'xts' was built under R
version 3.5.2
3: package 'TTR' was built under R
version 3.5.2
```

Now we need to use the getSymbols command to bring the data that we will use in GARCH model and it will be Facebook stock data and we will store it (Fb) by using this command → Fb<-getSymbols("FB",auto.assign =F) and press enter and the result will be the stock data of Facebook of the year 2012 and it will be stored in the (Fb):

```
'getSymbols'      currently      uses
auto.assign=TRUE by default, but will
use auto.assign=FALSE in 0.5-0. You
will still be able to use
'loadSymbols' to automatically load
data. getOption("getSymbols.env")
and
getOption("getSymbols.auto.assign")
will still be checked for
alternate defaults.

This message is shown once per session
and may be disabled by setting
options("getSymbols.warning4.0"=FALSE)
. See ?getSymbols for details.
WARNING: There have been significant
changes to Yahoo Finance data.
Please see the Warning section of
'?getSymbols.yahoo' for details.

This message is shown once per session
and may be disabled by setting
options("getSymbols.yahoo.warning"=FAL
SE).
```

If we want to see what is this data we use the command → head (Fb) the result will be:

```
           FB.Open   FB.High   FB.Low
FB.Close FB.Volume FB.Adjusted
2012-05-18    42.05    45.00   38.00
38.23 573576400        38.23
2012-05-21    36.53    36.66   33.00
34.03 168192700        34.03
2012-05-22    32.61    33.59   30.94
31.00 101786600        31.00
2012-05-23    31.37    32.50   31.36
32.00  73600000        32.00
2012-05-24    32.95    33.21   31.77
33.03  50237200        33.03
2012-05-25    32.90    32.95   31.11
31.91  37149800        31.91
```

Now we have the stock data of Facebook if we want to see the chart of this data we can do it by using the command chart_Series(Fb) it will open the chart for this data and it will be from 2012 until 2019 in the chart we see the stock market for Facebook is growing since 2012 until 2018 it stat going done and we can see it clearly in the Figure 2 that shows the Facebook stocks price:

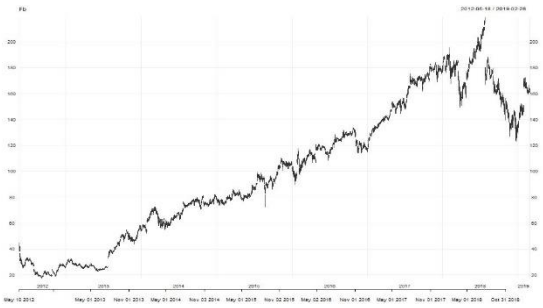


Figure 2 - Facebook stocks price

Now we take the FB.Close to do the GARCH model on it the way to do it by using the command → FbClose<-Fb$FB.Close the $ means that we need to take the FB.Close data and by the way we store it in FbClose to see the data we use the command → head(FbClose) and we will receive the result:

```
           FB.Close
2012-05-18    38.23
2012-05-21    34.03
2012-05-22    31.00
2012-05-23    32.00
2012-05-24    33.03
2012-05-25    31.91
```


UDK 330.43; DOI 10.2507/IJVA.5.1.5.59

Now we need to install the GARCH package and the name of this package in R-language is “rugarch” and we can install it by using the command → install.packages("rugarch") and it will be installed in R-Studio package system.

And if we want to check the package we use the command → library("rugarch").
Now it’s the time to build the GARCH model and we need to build it by using several commands:

The first command will be → Fb0<-ugarchspec(variance.model = list(model="sGARCH",garchOrder=c(1,1)),mean.model = list(armaOrder=c(0,0)),distribution.model = "std").

What we did we put the variance , mean and the distribution in the model and we use (0,0) as the mean because if we used larger number there will be no result at all because the model use the minimum value and we store it in (Fb0).

And the second command will be → FbGarch0<-ugarchfit(spec = Fb0,data = Fb$Close).

This command will activate the model and give use some results by the way we store it in FbGarch0 after that we see the results by using the command → FbGarch0 and we see what we got :

```
*---------------------------------*
*          GARCH Model Fit        *
*---------------------------------*

Conditional Variance Dynamics
-----------------------------------
GARCH Model      : sGARCH(1,1)
Mean Model       : ARFIMA(0,0,0)
Distribution     : std
Optimal Parameters
-----------------------------------
Estimate  Std. Error    t value Pr(>|t|)
mu    117.848477    0.25169 468.230899
0.000000
omega   1.483258    0.33576   4.417569
0.000010
alpha1  0.998993    0.11957   8.354842
0.000000
beta1   0.000007    0.12780   0.000052
0.999958
shape  99.999936   24.40302   4.097851
0.000042

Robust Standard Errors:
Estimate  Std. Error    t value Pr(>|t|)
mu    117.848477    0.62511 188.525699
0.000000
omega   1.483258    1.28268   1.156378
0.247526
alpha1  0.998993    0.23992   4.163916
0.000031
beta1   0.000007    0.24791   0.000027
0.999978
shape  99.999936    1.22662  81.524543
0.000000

LogLikelihood : -8471.395

Information Criteria
------------------------------------
Akaike       9.9430
Bayes        9.9589
Shibata      9.9430
Hannan-Quinn 9.9489

Weighted Ljung-Box Test on Standardized
Residuals
------------------------------------
statistic p-value
Lag[1]                      1591       0
Lag[2*(p+q)+(p+q)-1][2]     2375       0
Lag[4*(p+q)+(p+q)-1][5]     4660       0
d.o.f=0
H0 : No serial correlation

Weighted Ljung-Box Test on Standardized
Squared Residuals
------------------------------------
statistic p-value
Lag[1]                    0.0857 0.76971
Lag[2*(p+q)+(p+q)-1][5]           2.8916
0.42720
Lag[4*(p+q)+(p+q)-1][9]           9.0539
0.07924
d.o.f=2
Weighted ARCH LM Tests
------------------------------------
Statistic Shape Scale P-Value
ARCH  Lag[3]  0.0006206  0.500  2.000
0.98013
ARCH  Lag[5]  2.2798322  1.440  1.667
0.41264
ARCH  Lag[7]  8.3779082  2.315  1.543
0.04321

Nyblom stability test
------------------------------------
Joint Statistic:  469.6939
Individual Statistics:
mu       2.52781
omega    0.04648
alpha1   4.54412
beta1    0.28380
shape  442.01008

Asymptotic Critical Values (10% 5% 1%)
Joint Statistic:          1.28    1.47
1.88
```


UDK 330.43; DOI 10.2507/IJVA.5.1.5.59

```
Individual Statistic:      0.35     0.47
0.75
Sign Bias Test
------------------------------------
t-value   prob sig
Sign Bias           0.4474 0.6546
Negative Sign Bias  1.0337 0.3014
Positive Sign Bias  1.0822 0.2793
Joint Effect        2.6456 0.4496

Adjusted Pearson Goodness-of-Fit Test:
------------------------------------
group statistic p-value(g-1)
1    20      9703             0
2    30     14521             0
3    40     17731             0
4    50     16631             0

Elapsed time : 0.4993329
```

The most important information is the Akaike = 9.9430 the less it is the batter the model will be and that's how to build Garch model and how it works.
Akaike information criterion. The Akaike information criterion (AIC) is an estimator of the relative quality of statistical models for a given set of data. Given a collection of models for the data, AIC estimates the quality of each model, relative to each of the other models. Thus, AIC provides a means for model selection.

AIC is founded on information theory. When a statistical model is used to represent the process that generated the data, the representation will almost never be exact; so some information will be lost by using the model to represent the process. AIC estimates the relative amount of information lost by a given model: the less information a model loses, the higher the quality of that model.
In estimating the amount of information lost by a model, AIC deals with the trade-off between the goodness of fit of the model and the simplicity of the model. In other words, AIC deals with both the risk of over fitting and the risk of under fitting.

The Akaike information criterion is named after the statistician Hirotugu Akaike, who formulated it. It now forms the basis of a paradigm for the foundations of statistics; as well, it is widely used for statistical inference [7]. In the future if we build several Garch models the model with the lowest Akaike value will be the beat model to use.

Now lest try other company like Google and let's see how the model will be we do the same stapes that we did with the Facebook but we need to change the data by using the command → GG<-getSymbols ("GOOG",auto.assign =F) this help us to get the financials data for Google and we use the chart command to see the chart for Google stocks price. After doing the commands we will get both result for our model and the chart Figure 3 that shows the Google stocks pries and how it changes since 2007:

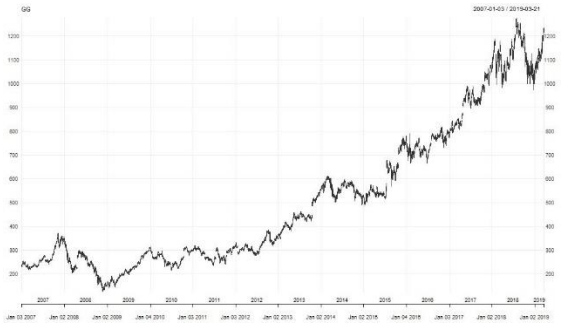


Figure 3 - Google stocks price chart

```
Information Criteria
------------------------------
-----

Akaike       12.232
Bayes        12.241
Shibata      12.232
Hannan-Quinn 12.235
```

Conclusion

So the Akaike is 12.232 and that means our model not that good and if we compare it with Facebook model we see that Facebook model is better than Google model and as we see the that we can use the model on Facebook stocks but we can't use It on Google stocks because it more efficient to use the model

International Journal - VALLIS AUREA • Volume 5 • Number 1 • Croatia, June 2019
UDK 330.43; DOI 10.2507/IJVA.5.1.5.59

that can help us to find the specific information or details of the stock of any company.

References

[1] GARCH 101: An Introduction to the Use of ARCH/GARCH models in Applied Econometrics *Available from:* http://www.stern.nyu.edu/rengle/GARCH101.PDF *Accessed:* 2019-04-15

[2] Autoregressive conditional heteroskedasticity *Available from:* https://en.wikipedia.org/wiki/Autoregressive_conditional_heteroskedasticity *Accessed:* 2019-04-15

[3] Overview of Volatility Clustering *Available from:* https://www.thoughtco.com/volatility-clustering-in-economics-1147328 *Accessed:* 2019-04-15

[4] A practical introduction to GARCH modeling *Available from:* https://www.r-bloggers.com/a-practical-introduction-to-garch-modeling/ *Accessed:* 2019-04-15

[5] GARCH Process *Available from:* https://www.investopedia.com/terms/g/generalalizedautogregressiveconditionalheteroskedasticity.asp *Accessed:* 2019-04-15

[6] What is a GARCH model? What are they used for? *Available from:* https://www.quora.com/What-is-a-GARCH-model-What-are-they-used-for *Accessed:* 2019-04-15

[7] Akaike information criterion *Available from:* https://en.wikipedia.org/wiki/Akaike_information_criterion *Accessed:* 2019-04-15

UDK 330.43; DOI 10.2507/IJVA.5.1.5.59

Category: review paper

Idlbek, Robert [1]
Vučković, Žarko [2]
Prpić, Ivan [3]

Development of Network Agnostic SIM Technologies for M2M Data Transfer

Abstract:

The development of smart devices and their functionality is not possible without adequate network connectivity.
Every two to three years, smart devices increase their processing power, amount of memory and functionality for double. One of the limiting factors in the process of creating new smart devices is the way they connect to the network.

Network connectivity must be reliable, inexpensive and financially affordable. Also, the device must be ready for manufacturing without additional costs. Many wireless networking technologies now exist on the market, but LPWAN and UICC are essential for the development of IoT devices in the next few years.

Keywords:

IoT connectivity; machine to machine; UICC; network agnostic SIM

Author´s data:

[1] Polytechnic in Pozega, Vukovarska 17, 34000 Požega, Croatia, ridlbek@vup.hr
[2] Wolf d.o.o., Miroslava Krleže 22, 34000, Požega, Croatia, wolf@po.t-com.hr
[3] student, Polytechnic in Pozega, Vukovarska 17, 34000 Požega, Croatia, iprpic@vup.hr

UDK 004.7; DOI 10.2507/IJVA.5.1.6.60

Introduction

In the last ten years, the available modern and high-tech services have changed considerably and created new ways of consuming them. By networking IP video cameras, mobile phones, various sensors, vehicles and machines, the basis for the provision of new services, that have not been possible or anticipated, has been created. Nowadays, most households have video surveillance and smart-home systems that can quickly and cheaply control the property. Smart mobile phones are powerful enough to enable surveillance of such equipment. The main reason for that transformation is the significant reduction in prices of before-mentioned equipment and the omnipresent availability of WiFi that enable its connections to the network. For 10-50 euros it is possible to acquire remotely operated switches that can be controlled by mobile phones from any location (e.g. Sonoff), and video surveillance can be purchased for 50 euros and receive alarms from motion sensors in a monitored space, and even store a video recording in the „cloud".

Machines, sensors, actuators and other devices become available through the network from any part of the world. Of course, the device must have access to the Internet. That allows an entirely different use of these devices, and data security is becoming increasingly essential and data more interesting to unauthorized users (for example, hackers).

According to Juniper [1], more than 13 billion devices are already connected to the network, and more than 5 million new devices are connected every single day. About 38 billion connected devices are expected by 2020. Approximately 40% of total Internet traffic is expected to be generated by machine-to-machine communication [2], without any human interaction. Such predictions indeed constitute an exceptional innovation potential and are expected to explore many new possibilities arising from the explosion of network connectivity. That undoubtedly presents good prerequisites for the development of many business ideas. Moreover, it arises many data security related questions as well.

This paper will present the primary ways of connecting IoT devices to the network, as well as technologies that will allow easy management of their network connectivity.

Machine-to-machine and IoT concepts

The term "Internet of Things" (IoT) is the application of intelligent devices interconnected through different forms of network connectivity, intending to collect data from sensors embedded in physical objects [3]. Development of IoT devices accelerated due to the decline in the price of network connectivity, and the advancement of embedded systems technology such as increasingly powerful microprocessors with low energy consumption (Arduino, Raspberry Pi and the like). That creates a cheap and industrially reliable solution to collect data from different digital and analogue data sources (sensors). ARM processors, which are mainly the foundation of such embedded systems, have sufficient processing power to collect and analyze data on a single device. Low power consumption allows the construction of systems that operate on batteries. For machine-to-machine data exchange (which does not require human interaction) it is necessary to provide

UDK 004.7; DOI 10.2507/IJVA.5.1.6.60

networking technologies that are acceptable regarding data bandwidth, energy consumption, data security, and device management.

Bandwidth

Most IoT devices require a small amount of data bandwidth. Simple sensors that report measured information once or twice a day, monthly don't require more than a few dozen kB of data traffic. On the other hand, vehicle monitoring needs data transmission at higher frequencies. Data transmitted in addition to the GPS location of the vehicle, contains numerous information. Some of additional data is: the number of GPS satellites to which the device is connected, LBS data from the teleoperator's base stations, current speed, and informations from various additional sensors (e.g. fuel level, current fuel consumption, cargo temperature, number of passengers, G force to detect inappropriate braking and harsh driving). This type of devices requires about 10-20 MB of data per month.

Finally, the extreme bandwidth consumers are video cameras and audio devices that can spend several GB of traffic per month.

Power consumption

The IoT device communication protocols, depending on their purpose, must be optimized for minimum power consumption. The reason is that most of these devices are not intended to connect to a constant power source (as is the case with a GPS tracker for vehicle monitoring). Some simple sensors need to work on an autonomous battery (often non-rechargeable battery) that allows autonomous operation for several years without charge while sending information once or twice a day. The amount of data transmitted can be several bytes per day, and it is essential to transfer them to the destination at a minimal energy cost.

More powerful IoT devices designed to transmit and analyze video and audio content, such as surveillance cameras, usually require a constant current source. The reason is that they consume much more energy considering video and image compression algorithms and object recognition (for example, detection movement or human recognition). More powerful processors require even more energy.

Security

Having in mind a large number of currently connected devices (with the expected substantial future growth), a significant challenge for network experts, hardware manufacturers and software developers is security. It is not about the security of the device itself (unauthorized access to the device), but also the tapping or intercepting and changing the data that comes from the device.

There is growing concern about the sabotage of IoT devices that can sabotage business activities, such as a production facility. That is an entirely new security issue and needs to be addressed on multiple levels: hardware level, software level, network level, and organisational level.

Device and software manufacturers are forced to raise the level of security.

So, first security management frameworks in the IoT world are emerging, such as the IoT Security Foundation [4]. Security becomes one of the major topics when it comes to the application of smart sensors in healthcare, smart home appliances, transport and energy management.

UDK 004.7; DOI 10.2507/IJVA.5.1.6.60

Device management

Managing a larger number of IoT devices is a problem. There is a growing need for a central application that is used to monitor the operation of the device, to diagnose the failure, and to change the configuration parameters. The important functions of such management platforms also provide software updates (firmware), which is important in the case of security vulnerabilities that can be solved by software patches.

In short lines, this can be defined as mangement IoT devices:

IoT device management is the process of authenticating, provisioning, configuring, monitoring and maintaining the device firmware and software that provides its functional capabilities. Effective device management is critical to establishing and maintaining the health, connectivity, and security of IoT devices [6]

3. Machine to machine communication

From the previous text, it is apparent that IoT devices for their work must achieve communication connection to send collected/processed data. More technologies can be used to accomplish this network connectivity, and its choice is primarily based on the specific application of the device. In the past decade, we have seen an intense penetration of internet and network technologies in the so-called "consumer technology" arena.

The connection to the Internet today have home alarm systems, heating and cooling systems, and even toasters and washing machines. The reason for this lies in the fact that the network electronics that is convenient for connecting the devices to the Internet has become incredibly inexpensive (1 EUR per piece for wired Ethernet port and 3-4 EUR for a wireless antenna connection). Moreover, a marketing presentation of a device that can connect to the Internet is always more vibrant, and to the average customer more attractive, although the applicability of such devices is questionable.

Initially, connection to the Internet was solely based on the ethernet UTP network connection, and after that, a growing number of devices supported wireless technologies (802.11a / b / g / n / ac). Such devices are connected to a local wired network or a short-range WiFi wireless network - typically up to 10-50 feet from a network router.

IoT devises today use one of the following network technologies for Internet access and consuming network services.

Bluetooth

Bluetooth represents a network data exchange protocol between two or more network devices. Typically, and in real terms, it works at a distance of 10 m. Bluetooth protocol is part of most of today's modern devices, from computers and cameras to cell phones where it has been an inevitable part for years. As the Bluetooth network connection consumes little electrical energy (especially for the latest generation of BT protocols like 4.2 BLE), the peak load is about 15mA, which is excellent for battery-powered devices [8].

The short distance from one device to another for sending and receiving data ensures a high level of security and prevents the eavesdropping and altering of data from a malicious attacker.

WLAN

A wireless network based on radio frequency is the standard for transferring data to small distances, mostly within a home or small business space.

UDK 004.7; DOI 10.2507/IJVA.5.1.6.60

Communication standards are based on the IEEE 802.11 set of protocols, and the latest 802.11ax standard supports speeds from 600 up to 9608 Mbit/s. Today, 802.11n and 802.11ac are base protocols, and widely used in most of the new mobile devices and multimedia audio-video devices that require faster data transfer.

WLAN network connectivity is used primarily by two types of devices:

1) Those who require a large amount of data transmitted for their work (for example video cameras), and

2) those devices require low power consumption for their work and are close to the wireless access point (for example, measuring devices that are put on livestock and recorded life activities).

A wireless network is a right choice for IoT devices that are connected to the local area and do not need to change its location. Given the small distance on which they work (in realistic conditions up to 30m, outdoors and up to 300m), the number of devices that use them is limited.

Cellular network

Lately, there has been an increasing number of devices that need to send and receive data from geographic locations that do not have a wired or WiFi connection. Among the first such devices are the GPS tracking devices already mentioned. Their network connection is based on a communication module with a SIM card that can connect to GPRS, 2G, 3G, or 4G networks.

In most countries, GSM coverage is excellent. In Croatia, there are three mobile operators: A1, T-Mobile and Tele2. In the early 1990s, the first GPS standard for 2G devices was adopted [7], which allowed the connection of a large number of IoT devices that now function precisely on the 2G communication standard. Although this way of communication is slow for today's modern mobile phones and user needs, it is fast and energy efficient enough for IoT devices. That is why it represents underlying technology even today, almost 30 years later.

2G technology is in use so much that some countries plan to shut down the 3G network and leave 2G up and running for the next few years. This shutdown free additional frequency bandwidth for upcoming technologies and networks [8].

The reason for this is the M2M market and the connection of a large number of IoT devices that now operate on 2G.

To accomplish the transfer, the device in the cellular network requires a Subscriber Identity Module (SIM) card purchased from a teleoperator providing a data transmission service. Services may be associated with a voice transmission, sending and receiving SMS messages and data transfer. When purchasing a SIM card, the terms and conditions in which the card works and the prices for individual services are subject to negotiate with the teleoperator.

For example, If the card leaves the local network, the device connects to the network of another operator and the roaming service is charged. From 15 June 2017 in the European Union, the new roaming regulation is called Roam Like At Home and provides the same prices for network services (voice, data, SMS) like they are on the local network [9]. Such a rule significantly reduced the cost of using mobile telephony for those persons or devices travelling within the EU, Norway, Iceland and Liechtenstein. However, devices that use SIM cards recognize the new network as roaming and

accordingly can disable certain services if they are potentially expensive for the user. Also, a device with SIM card of the local operator cannot be out of the local mobile network all the time, so this is a constraint in using local providers for IoT devices outside the county.

Low-power wide-area network (LPWAN)

LPWAN or low-power wide-area (LPWA) network or low-power network (LPN) as an idea represents wireless networking technologies designed for IoT devices that exchange small amounts of data over long distances and use low data bandwidth. Because of these characteristics, LWPAN is designed for various sensors, actuators and devices intended for the IoT ecosystem. The transfer rate is up to 50 kbit/s per channel, which is insufficient for computer connections, mobile phones or other large bandwidth applications.

In addition to long-distance transmission (up to 10-40 km) and low power consumption, an essential feature of LPWAN is the low transmission cost.

Within the LPWAN concept, there are currently three different wireless technologies, and new ones are developing rapidly: DASH7, Sigfox and LoRa.

Network agnostic SIM - UICC

The technology for access to the cellular network, as mentioned, exists for 30 years and is based on a communication module and the SIM card of a particular mobile provider. The mobile operator is the one that offers the user of a card a specific service price (voice, SMS, data) and the change of the mobile operator requires the change of the SIM card in the device (phone or IoT device).

Changing the SIM card is accessible in mobile devices that users always have nearby. However, changing the same card in IoT devices is often problematic considering their number and possible physical inaccessibility. Besides, to physically change the card, it is necessary to change the configuration parameters of the IoT device so that it can access the network. In data traffic, a parameter that requires a change is called Access Point Name (APN), and each mobile operator has a different APN name. For example, the Croatian operator T-Mobile APN is "internet.hr.hr", while for A1 it is "internet". Therefore, once selected mobile operator service provider is not changed without a good reason, although other providers might offer better terms and conditions for using their services.

The new technology, called Universal Integrated Circuit Card (UICC) solves this problem. Simplified, UICC is a solution for easy changing prefered mobile network operator, without changing the SIM card itself. The companies which sell UICC card are not classic mobile operators. These companies do not have their network infrastructure, and their services and products are based on the SIM cards that can connect to a different mobile operator with whom the company has a signed contract.

For example, if the company has a signed contract with T-Mobile and A1 in Croatia, then the device using the specified UICC SIM can change the service provider on the fly, almost instantly. The device does not need to change the APN configuration for A1 or T-Mobile operator and can use the cheapest service, or service with better signal. The device itself does not see the difference between the two operators, nor does the operator change play a role in the functioning of the device.

UDK 004.7; DOI 10.2507/IJVA.5.1.6.60

As examples of such companies, we can list names like Things Mobile, PodM2M, DolphinM2M and EMnify. The new name for this type of enterprise is the Mobile Virtual Network Operator (MVNO), Virtual Network Operator (VNO), or Mobile Other Licensed Operator (MOLO). So, MVNO is a wireless communications services provider that does not own the wireless network infrastructure over which it provides services to its customers. An MVNO enters into a business agreement with a mobile network operator to obtain bulk access to network services at wholesale rates, then sets retail prices independently. An MVNO may use its customer service, billing support systems, marketing, and sales personnel, or it could employ the services of a mobile virtual network enabler (MVNE)[11]

Two fundamental characteristics of UICC cards are: [10]:

- Provisioning:

Classic SIM cards come with installed data/application for one mobile service provider (MNO); its change requires a physical change of the card. In contrast, UICC cards allow MNO change as needed, on the fly. The device with this type of card always connects to the network with the most reliable coverage and the cheapest service for the user.

- Device management:

Classic SIM cards need activation before use. The activation procedure follows placing the card in the mobile device, activating the PIN password, and then returning the card to the target device. Once activated, it has a certain monthly fee and cannot be easily deactivated or paused if the user doesn't need the service anymore. Often, to activate and deactivate the card, it is necessary to contact MNO (for example T-Mobile) and sign a contract or authenticate some of the documents. Managing UICCs is easy because the user can activate and deactivate the cards without paperwork, and without an additional mobile device for activation. In addition, it can change the card's workflow parameters and know whether or not it is active, how much data traffic is consumed over the specified card or network, which cards are card is connected to what MNO and when, and to activate and deactivate additional services such as voice or SMS on the fly.

Furthermore, it is possible to lock the SIM card to a particular device International Mobile Equipment Identity (IMEI number) so that it can not move to another device. Also, the user can configure various spending limits and network connections like VPN and fixed IP address. Another exciting option is to track the location where the card is used (on the map) regarding the LBS information obtained from the currently active mobile operator.

Conclusion

This paper presents the problems of connecting the IoT devices to the network, which is a critical component in their operation. Having in mind a large number of IoT devices, it is necessary to adopt a technology that provides a cost-effective, comfortable, long-lasting, cheap and stable network connection.

The current SIM cards are limited to only one teleoperator (MNO), but by the appearance of UICC cards and the change of legal regulation that enables businesses to provide network services using the infrastructure of another operator, more and more companies are competing in the M2M arena in providing services that could not be

imagined a few years ago. There is a significant departure from the classic signing of contracts for each SIM card in the direction of the use of services according to their own needs, activation and deactivation of all required parameters independently and without the need to contact teleoperator.

Transition to UICC technology is expected in the next few years. That is particularly applicable to current devices, and older generation devices would have the most benefits from it. However, the development of network technology is emerging in the direction of eUICC; that is, the installation of the UICC smart chip in the microprocessor of the device itself. In this way, all devices will be able to connect wirelessly to the network without the need for a SIM card.

References

[1] Juniper Research. (2015). Internet of Things connected devices to almost triple to over 38 billion units by 2020 [Press release]. Retrieved from http://www.juniperresearch.com/press/press-releases/iot-connected-devices-to-triple-to-38-bn-by-2020. [Accessed 17 Feb 2019].

[2] Capgemini (2015). The impact of Internet of things on Financial services. [online] Available at: ww.capgemini.com/resource-file-access/resource/pdf/the_impact_of_the_internet_of_things.pdf [Accessed 17 Feb 2019].

[3] GSM Association (2014). Understanding the Internet of Things (IOT). Available at: http://www.gsma.com/connectedliving/wp-content/uploads/2014/08/cl_iot_wp_07_14.pdf [Accessed 17 Feb 2019].

[4] IoT Security Foundation (2019). [online] Available at: https://www.iotsecurityfoundation.org [Accessed 17 Feb 2019].

[5] i-scoop (2017). IoT device management: challenges, solutions, platforms, choices, market and future [online] Available at: https://www.i-scoop.eu/internet-of-things-guide/iot-device-management [Accessed 20 May 2019].

[6] Hamilton, D. (2018). The future of IoT device management [online] Available at: https://www.networkworld.com/article/3258812/the-future-of-iot-device-management.html [Accessed 20 May 2019].

[7] BrightHun (2011). History of Cellular Technology: The Evolution of 1G, 2G, 3G, and 4G Phone Networks [online] Available at: https://www.brighthub.com/mobile/emerging-platforms/articles/30965.aspx [Accessed 20 May 2019].

[8] https://www.mobileworldlive.com/featured-content/top-three/telenor-norway-shut-3g-network-2020-five-years-2g/

[8] Everything RF (2017). [online] Available at: https://www.everythingrf.com/community/what-is-the-difference-between-bluetooth-5-0-bluetooth-low-energy-bluetooth-v4-2-and-classic-bluetooth [Accessed 18 Oct. 2018].

[9] T-Portal (2017). [online] Available at: https://www.tportal.hr/tehno/clanak/veliki-vodic-kroz-ukidanje-roaminga-evo-sto-nas-ceka-od-15-lipnja-20170516 [Accessed 8 Feb. 2019].

[10] EMnify eUICC: what it is and why it matters (2016). [online] Available at: https://www.emnify.com/blog/2016/01/29/euicc-what-it-is-and-why-it-matters [Accessed 13 Feb. 2019].

[11] Berec.europa.eu. (2016). [online] Available at: https://berec.europa.eu/files/document_register_store/2016/8/NN%20Factsheet.pdf [Accessed 18 Jul. 2018].

UDK 004.7; DOI 10.2507/IJVA.5.1.6.60

Category: review paper

Tomić Dalić, Višnja [1]
Uršić, Daliborka [2]

The Role of Insurance to Protect the Right of Passengers in Air Transport in Case of Damage to Health, Injury or Disposal of Passengers

Abstract:

The paper deals with how carriers in air transportation sector are to deal with their liability in systematic manner, with an emphasis on passengers rights. National, international, and European Union regulations are scrutinized concerning the obligations and responsibilities of the carriers arising from a contract for carrying of persons (passengers), in the adverse event of damage to health, injury, and/or death. Furthermore, what options are available to the passengers in seeking monetary compensation regarding both property, and non-property damages. The stress is on insurance against liability which may arise from referenced contract, and also the benefits of institute of compulsory as well as voluntary insurance policy.

This particular topic is very interesting, due to so-called travel law can be specified as a sub-branch of transportation, and/or respectively transport. Therefore, the sources of legal rights of so-called passenger's rights are based on three-dimensional level, in terms of applying and comparing the legal sources on national, international, and European level.

Keywords:

Carrier liability; damage due to passenger injury or death; montreal convention; Regulation 889/2002

Author´s data:

[1] lecturer, Prison in Požega, Osječka 151 A, Požega, visnja.tomicdalic@uzs.pravosudje.hr
[2] Polytechnic in Požega, Vukovarska 17, Požega, dursic@vup.hr

UDK 355.691.4:614.862; DOI 10.250//IJVA.5.1./.61

Introduction

The insurance institute acts as a foundation as protection for business in order to conduct commerce. Purely from economic standpoint, as the businesses' profits increases, they have an even higher interest and a need to insure their assets from potential harmful consequences. Recent technological advances have aided air carriers to increase their capital accumulation, and at the same time, earned capital is further-more invested in financial vehicles with higher risks. It is clearly imperative for companies to do everything in their power in order to avoid potential accidents. To maximize protection, in conjunction to purchasing insurance policy, they engage technological security measures as preventive measure. In a case of un-avoidable incident, the liability for damages and it compensation would fall on the policy underwriter.

In parallel with the development of transport branches, and thus the transport of passengers through all branches of transport, that is, transport of passengers by road, rail, inland waterways, sea waterways and relatively new air transport, there has been an increasing need for passenger insurance. Transportation of passengers at the very beginnings of the transport sector took place together with the transport of things. The first appeared on road transport, then maritime and river, and rail transport, which is special due to the infrastructure itself, as it depends on the construction of railway lines. Air transport is the latest developed. We assume that the wide range of traffic spectrum through various transport branches has led to the growing need for the development of a special insurance institution for passengers. The interest of an individual to look for some form of security and protection results in an increasing demand in the economic market, and therefore an ever-more global system of insurance. Passenger insurance can be studied on both sides, as a form of passenger protection, but also as a carrier protection. In what sense? It is important to say that the occurrence of passenger insurance provides certain security in case of damage occurring to the injured party through the insurance institute itself, and by the insurer, who, under the insurance contract and the occurrence of the damage, is obliged to pay a certain fee on the basis of a direct request injured parties. Thus, the injured party is enabled to send a direct claim for compensation to the insurer, which in any case is a much more acceptable and more solvent debtor than the carrier itself. On the other hand, the carrier, whose responsibility for the resulting damage arises from the contractual relationship under the contract of carriage, by paying the insurance premium to the insurer leaves the damage to the injured party directly from the insurer. This is also protected by the carrier from damages, but in what form and in which way we will explain it in more detail. It is important to note that this is not excluded from liability of the carrier, nor is he exempted from liability, but by this method he is provided with a system of protection against excessive damages that could arise during his business and lead him to complete ruin.

In order to prevent risky business of transport activity through all branches of transport, a state intervention was necessary in terms of the introduction of a compulsory insurance institute. The compulsory regulations are precisely certain forms of compulsory insurance, as well as the obligation to make compulsory insurance and the

UDK 355.691.4:614.862; DOI 10.2507/IJVA.5.1.7.61

risks covered by the insurance. An example of such a regulation is the Law on Compulsory Motor Insurance [1]

Methodology For Inspection In Air Transport

The insurance of passengers in air transport or passenger rights is based on a comparative or comparative methodology, ie a three-dimensional comparison of legal sources at national, international and European level. By researching and studying thoroughly, we will finalize considerations with a focus on defining the role of the insurance institute in the protection of passenger rights. This topic is very interesting since the so-called. the passenger right can be specified as a subordinate transport or transport right. Particularly the matter of passenger law is regulated by special national, international and EU regulations. Since we have become a full member of the EU, European regulations are also mandatory in our system, and comparing our national regulations with Europe is particularly interesting in this area of passenger law. Therefore, the processing of legal sources of so-called " passenger rights in this paper is based on a three-dimensional level in terms of application and comparison of legal sources at national, international and European level. So, by means of a comparative method of presenting the legal arrangement of passenger rights, we can come to specific conclusions regarding the role of insurance in the protection of passenger rights at the national, international and EU level.

Results and Disputes on the Protection of the Right of Passengers in Air Transport

Producing Right of Travel in Accordance With Croatian National Law

According to the Convention on the Equalization of Certain Rules in International Air Transport (hereinafter Montreal Convention), which entered into force on 4 November 2003 [2] and Croatian regulations provide for a two-stage system of liability for damage caused by the death and bodily injury of passengers pursuant to Articles 15 to 22. Law on Obligatory and Really Legal Relations in Air Transport [3] Prior to these provisions, the Decision on Monetary Measures Limiting the Responsibility of National Carrier Air Navigation [4], which was later abolished, was applicable because it was not aligned with the Warsaw Convention and its Protocols.

This means that an air carrier is held accountable on the basis of objective liability in the event of damage of up to 100,000 special drawing rights (SDRs) per passenger without the possibility of exclusion or limitation of liability. However, there is a situation where the carrier fully or partially releases the liability in the event that he or she proves that the damage was caused or its creation has contributed to the negligence or other unlawful act or omission of the person seeking remuneration or to the person from whom he exercises his rights to the extent that such negligence, unlawful act or omission caused or contributed to its creation. Likewise, the carrier shall be wholly or partly exempt from liability where compensation for damage due to death or bodily injury to a passenger requires a person other than the passenger himself, to the

UDK 355.691.4:614.862; DOI 10.2507/IJVA.5.1.7.61

extent that the carrier proves that the damage was caused or that its occurrence was contributed by negligence or other unlawful act or failure of that passenger [5]. Thus, the carrier has the ability to diminish its responsibility proportionately as stated, of course, under the provisions of the Montreal Convention. The second level of liability of a carrier relates to claims claims exceeding the amount of 100,000 special drawing rights (SDRs) per passenger where an air carrier is liable on the basis of guilty grounds, according to the criterion of subjective liability where the airline's guilt is assumed. In these cases the carrier agrees unlimitedly. However, here too it is possible to freely or partially release a carrier if it proves that:

a. the damage did not arise due to negligence, or any other harmful effect or omission of the carrier or its officers or agents, or

b. That the damage was caused by negligence or other adverse effects or omissions by a third party [5]

This two-way accountability model has been in use since 2009. However, it is important to note that our largest national air carrier, Croatia Airlines, has applied this system of liability of the air carrier on the basis of objective liability criteria up to 100,000 special drawing rights from 1995 onwards based on the guilty plea. Namely, Croatia Airlines is a member of the International Air Transport Association (IATA), which applied this mode of responsibility irrespective of national regulations. Based on our General Terms, our domestic air carrier has already taken on contemporary cargo liability models and equalized the rights of passengers in domestic and international transport, despite a completely different legal norm.

Prohibition of Travel Rules Under International Law

Air transport is a relatively new branch of transport that has a multitude of regulations, conventions and treaties. Consequently, we will list certain conventions and their key provisions in order to get a clearer picture of the importance of today's regulations in force. First of all, we will start from the Warsaw system and make the following conventions and its protocols:

-The Warsaw Convention-Convention on the Equalization of Certain Rules on International Carriage by Air of 1929. This convention provided for a limited subjective liability of the carrier on the basis of guilty plea for the death or bodily injury of a passenger to a sum of 125 000 gold francs per passenger for hand- baggage of 5000 gold francs per passenger, and for gifted baggage of 250 gold francs per kg

- The Hague Protocol - Protocol amending the Convention on the Equalization of Certain Rules on International Carriage by Air, 1929, adopted in 1955. introduces a higher limit of liability of the carrier to the amount of 250,000 gold francs, simplifying the provisions on transport documents. -The Warsaw Convention on the Amendment of the Warsaw Convention, adopted in 1961, introduces the equalization of the responsibility of the actual and contractual carrier

-Guatemals Protocol on Amendments to the Convention on the Equalization of Certain Rules of International Air Transport, 1929, adopted in 1971. It introduces a system of objective liability of the carrier and raises the limit of liability for death or injury of passengers to the amount of 1.500.000 gold medals

UDK 355.691.4:614.862; DOI 10.2507/IJVA.5.1.7.61

-Montreals Protocols for Amendments to the Warsaw Convention adopted in 1975. It represents the previous three protocols (1 Warsaw Convention, 2.Hasic Protocols 3.Guatemals Protocol, and Protocol No. 4. It introduces objective objectives of carrier and freight transport.

We will further mention the Montreal Agreement of 1966 that we can not take a formal agreement or revision of the Warsaw Convention, but a private agreement between the airline carriers of IATA (International Air Transport Association) carriers involved in US / and who have given great criticism to the Warsaw Convention because of the overly restrictive responsibilities that have led to the objective liability of the carrier, the gamble of responsibility raised to $ 75,000. Thus, in this series, a significant IATA-Intergovernmental Agreement has in fact three separate agreements: the IATA Intergovernmental Agreement on Passenger Responsibility, the Agreement on Measures Received by the IATA Intergovernmental Agreement, by the Agreement. In this Agreement, the 1995 IATA member states all limitations of air carrier liability imposed by the Warsaw system and introduces a system of objective liability up to the limit of 100,000 SDR, and over that limit corresponds to the full amount of the claim based on the guilty plea. This has expanded and territorial application of the Agreement to all cargo contracts by the signatories of this Agreement, not only on the territory of, or in the United States, as regulated by the Montreal Agreement of 1966.[6]. The Warsaw system[6] has been in force for many years, but the tendency of unification and equalization of international rules has led to the following convention:

- Montreal Convention of 1999. [6] which introduces a two-stage liability liability system for the death and bodily injury of passengers, which means the carrier's objective liability of up to 100,000 SDR per passenger and over this amount corresponds to the assumed guilt in fact unlimited according to the 1995 IATA Agreement and EU Regulation 2027/97.

In any case, the Montreal Convention was a model for our legislation, as it has been accepted and ratified by us, and our regulations are fully harmonized. We have especially seen this by the ZOSOZP, which takes over the entire agreement system on passenger and luggage transportation and the responsibilities in this area from this Convention[5].

Of course, it is necessary to mention the following conventions and protocols that have contributed to the development of international aviation, particularly in the field of passenger and luggage transport:

- Convention on the Allocation of Certain Rules of Damage Caused by Third-Party Airplanes on Third Country Land Issued in Rome, 1933, which for the first time prescribes the objective liability of the carrier for damages caused by the aircraft to persons on the ground, but no new convention has been entered into force:
- The 1952 Rome Convention, which entered into force on 4 February 1958. is based on the objective liability of the owner or aircraft user for damages caused to third parties on the ground caused by the aircraft
- The Montreal Protocol of 1978, which entered into force on 25 July 2002. introduces some amendments to the 1952 Rome Convention, but R Croatia has not acceded to this convention or its protocols

Protect the Rule of Travel in Accordance With EU Provisions

International Journal - VALLIS AUREA • Volume 5 • Number 1 • Croatia, June 2019
UDK 355.691.4:614.862; DOI 10.2507/IJVA.5.1.7.61

Accession to the EU preceded the year and year of preparation and alignment of our legislation with EU regulations in order to be able to function in that multi-state system, which nevertheless allows for the preservation of its sovereignty and autonomy, yet it demands association for better economic activity. Officially, the process of aligning our legislation with the European Union started with the signing of the Stabilization and Association Agreement with the EU on 18 October 2001. This agreement has obliged Croatia to adapt its legislation regarding administrative, technical and other regulations to EU legislation that is at a particular moment in air and land transport. So we can immediately mention art. 184.d. ZOSOZP who says that this law is in line with European regulations[7]. In the chronological order of the guidelines and ordinances we will clarify each one individually with a short summary:

1. Council Directive 90/314 / EEC of 13 June 1990 on package travel, package holidays and package travel as set out below Directive 90/314 / EEC [8]

This guideline provides the right of passengers to obtain accurate travel information and guarantees certain rights if the travel organizer does not meet the agreement.

2. Council Regulation (EEC) No 295/91 of 4 February 1991 on the establishment of common rules for the denial-of-service compensation scheme for scheduled air services (hereinafter: Regulation 295/91) [9]

This decree referred to the denial of boarding because of the overbooking overcrowded. The scope of this Regulation covered only flights departing from the airport in the Member State. The provisions concerned only the denial of embarkation, therefore it was necessary to extend these provisions made by Regulation 261/2004 .

3.Council Regulation (EC) No. 2027/97 of 9 November 1997 on Airborne Accidents Responsibility - Regulation 2027/97 [10]

This decree regulates the liability of an air carrier in the event of an accident, and has been made due to the increasing need for passenger protection due to the excessive limits of liability and the lengthy court proceedings and the need to harmonize international and domestic rules. It introduces a two-tier liability system where the carrier responds on the basis of objective liability limited to the amount of 100,000 SDR, and over this amount based on the guilty plea. The carrier may be absolved of liability in whole or in part if it proves that the passenger caused or contributed to the damage. The news item is that there is an obligation of an air carrier to make compulsory liability insurance in the amount of 100,000 SDR per passenger. Prepayment is also provided for a minimum of 15,000 SDR in the event of a person's death. These separate newspapers are in fact the provisions that air carriers must specify in their General Business Conditions.

4. Council Regulation (EC) 889/2002 of the European Parliament and of the Council of 13 May 2002 amending Council Regulation (EC) No 2027/97 on air carrier liability in the event of accidents - to Regulation 889/2002 [11]

It is primarily this decree that the provisions of the Montreal Convention apply to the carriage of passengers and luggage. Also, this decree introduces some newspapers, so raising the amount of advance payment at 16,000 SDRs for death. Thus, certain provisions relate to the rights of all passengers to a summary of all the relevant

UDK 355.691.4:614.862; DOI 10.2507/IJVA.5.1.7.61

regulations relating to liability for passengers and their luggage, and carriers are obliged to provide written notice of the liability liability of the carrier in the event of death or injury to the passenger for that flight.

5. Council Regulation 261/2004 of the European Parliament and of the Council of 11 February 2004 on the establishment of common rules on compensation and assistance to passengers in the event of denied boarding and cancellation or long delay of flights and repealing Regulation (EEC) 295/91 [12]

This Decree replaces the 1991 Decree, which refers only to denied boarding and extends its provisions on flight cancellation and flight delays. Our ZOSOZP is fully aligned with this decree, so I'm referring to the section that talks about it. Also, the general condition of our air carrier includes a notice to passengers on Regulation 261/2004 of the European Union which regulates passengers' rights due to deferred embarkation, flight cancellation or longer delays in air transport.

Insurance of Passengers in Air Transport

Obligatory Insurance in Air Transport

A. OBLIGED INSURANCE UNDER Law on Compulsory Motor Insurance

We differentiate between two types of compulsory insurance in air transport:

a. Insurance of air carriers or airline operators of liability for damage caused to third parties and passengers

b. Insurance of Passengers in Public Transport Due to Accidents

Therefore, we will individually handle each type of compulsory insurance.

a. Insurance of air carriers or airline operators of liability for damage caused to third parties and passengers

Obligatory insurance in air transport is a type of contractual insurance because it is created by the conclusion of an insurance contract. According to the Law on Compulsory Motor Insurance , insurance is provided for the air carrier, ie air carrier, of liability for damage caused to third parties and passengers as compulsory insurance in air transport. Obligations to conclude this type of insurance are all air carriers and aircraft operators registered pursuant to Regulation 785/2004[13] if they are in the territory of the Republic of Croatia or in its airspace. In this insurance, as well as the insurance contractor, the aircraft operator is due to his specific responsibility for later. The definition is that "the operator of the aircraft is a person or entity other than an air carrier and who constantly and actively decides on the use or operation of an aircraft; it is assumed that the aircraft operator is a natural or legal person on whom the aircraft is registered, unless that person proves that another person is an operator. "This means that the aircraft operator is either the aircraft owner or the actual aircraft operator who is responsible for certain situations . The aircraft operator is responsible for the damage caused to the earth due to the death or bodily injury of a third party and to the damage caused to the aircraft caused by the aircraft for the damage caused by the things that were fired or thrown out of the aircraft in flight. [3]The aircraft operator may be fully or partially release the liability if the damage was caused by the action of

UDK 355.691.4:614.862; DOI 10.2507/IJVA.5.1.7.61

the injured party or the person who worked on the order and for the injured party in proportion to the contribution of the said persons in the event of damage. If a harmful action is caused by the operation of a third person, the operator of the aircraft corresponds to the solidarity of the burden of his guilt. According to the above mentioned situations, full or partial release of the aircraft operator's liability may result. Only to the full release of liability comes in the situation when the damage was caused by the cause outside the aircraft, whose actions could not be foreseen or avoided or eliminated. The responsibility for damage due to death or bodily injury amounts to 100,000 special drawing rights per killed, injured or injured.

This insurance covers the following damages:

- Damage to third parties due to death, bodily injury or disruption of health, destruction or damage to property during flight
- Damage due to death, bodily injury or disturbance of passengers' health during aircraft flight
- Damage to the loss of personal belongings of passengers in the aircraft cabin
- Damages due to loss or damage to cargo and delivered luggage

From the aforementioned damages we can see that this insurance covers damage to third parties, travelers and their luggage and their cargo. Third parties are considered to be any natural or legal person other than passengers and members of flight and crew during flight of aircraft. Passengers are persons who are transported with the consent of the air carrier or airline operator. Flight and cabin crew members are not considered passengers.

This insurance covers the basic transport risks we have mentioned in the previous branches of transport, as well as the additional transport risks we have not mentioned so far, since they have not been covered by compulsory insurance. These are the following risks:

- war operations
- terrorism
- kidnapping
- sabotage
- unlawful appropriation of aircraft
- public disturbances

Reasons for introducing additional risks in the compulsory insurance policy are increasingly frequent causes of harm to thirds or passengers, and especially terrorist attacks.

In any case, by the occurrence of a secured case, the injured party has the right to submit a direct claim for compensation to the insurer who, on the basis of the insurance policy, pays the amount of the insured amount provided for by law. The lowest insured amount amounts to third parties:

- 750,000 SDRs up to 700,000,000 SDRs for aircraft of 0-500,001 kg

The lowest insured amount for a particular passenger is 250,000 SDR except for the carriage of passengers by an aircraft with an MTOM of 2,700 kg or less and which is not used for commercial purposes when the lowest insured amount is 100,000 SDRs. Also, the lowest secured baggage allowance of 1,000 SDRs and a charge per kg 17 SDR is also specified.

These statutory provided sums can be increased, but the Government of the Republic of Croatia decides solely on this.

b. Insurance of Passengers in Public Transport Due to Accidents

Secured [14]

UDK 355.691.4:614.862; DOI 10.2507/IJVA.5.1.7.61

This insurance provides exclusive protection to passengers since air carriers or aircraft operators carrying out the carriage of persons and things in public air transport are obliged to conclude the insurance policy. Travelers are considered to be persons on board an aircraft, in an air port or in the immediate vicinity of the means of transport prior to boarding or after boarding. Passengers are also considered to be persons entitled to free ride.

The lowest insured amount per one incident per passenger is:

- in case of death 40.000,00 HRK
- in case of permanent disability 80.000,00 HRK

The passenger has the right to submit a direct claim to the insurance company with which the air carrier has concluded the insurance contract, thereby enabling a faster and easier way of collecting the damage suffered.

B. OBLIGATORY INSURANCE BY Law on Obligatory and Really Legal Relations in Air Transport

Compulsory insurance under Law on Obligatory and Really Legal Relations in Air Transport implies air transport insurance to which the provisions of the Maritime Code apply. Thus Art. Articles 743 to 747 of the CM provide for an obligation on an air carrier to ensure, by virtue of its liability for damage caused to third parties, to an appropriate height. An adequate amount means the amount of insurance that would be sufficient to settle the total compensation in an eventual damages for any person who would be entitled to compensation. The law does not specify the exact amount of insurance required but is left to the decision makers themselves with regard to the different aircraft capacities or the number of passengers that an aircraft can carry. Thus, the amount of 100 000 SDR would multiply the number of passengers and get the limit to which the carrier would have to provide. Of course this is only the lowest secured sum, but it can certainly be bigger.

Insurance Under Montreal Convention and EU Provisions

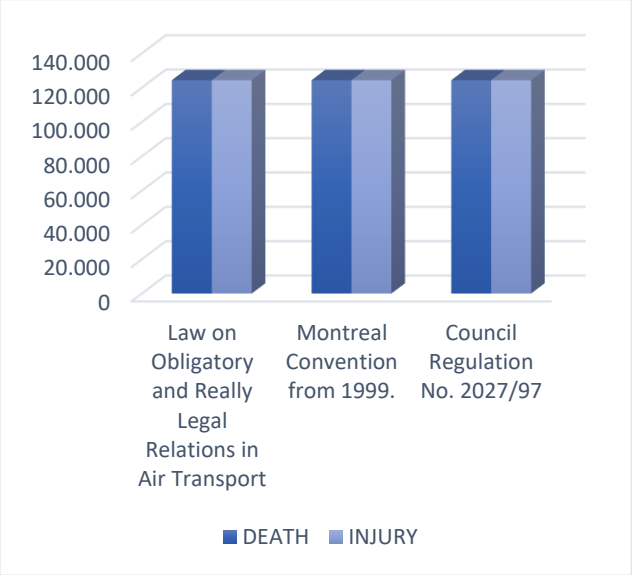
The compulsory insurance mentioned above under point a has been fully taken over by Regulation 785/2004. thus achieving consistency with European regulations. Given that at international level, the Montreal Convention provides for the compulsory insurance of the liability carrier provided for in this Convention without any detailed definition of the amount of the sum insured. In view of this, the provided sum includes the limit on the liability of the carrier, which is in fact 100 000 SDR per passenger, as well as the provisions of Regulation 889/2002 (or Regulation 2027/97), which also provides for compulsory insurance of the carrier to legal limitation of the amount of liability for damages. However, this decree is in full compliance with the Montreal Convention, the EU accession, and in its provisions regulating the same area, it merely invokes the provisions of the Montreal Convention, while other rights are specifically identified and at the same time avoided the conflict of jurisdiction between these two sources of rights.

Conclusion

At national level, all carriers are subject to the institute of compulsory insurance of passengers in public traffic due to the accident. This type of insurance is a standard form of insurance in favor of a third party where the carrier as the policyholder pays a premium in the event of an accident the

insurer pays to the passenger an accrued amount of insurance. The insured case in this insurance is the occurrence of the injury or death of a passenger and on this basis the basis for the payment of the insured is created. The Law on Obligatory Traffic Insurance, in addition to this compulsory insurance, also prescribes the compulsory liability insurance for damage caused to third parties and passengers. It is important to emphasize that this is a liability insurance in which the carrier is actually insured and paid the premium if an accident in which his responsibility was established and that he would not pay the compensation himself to the injured party, the injured party submits his claims to the insurer who pays the amounts to a statutory amount. This compulsory liability insurance provides legal protection for passengers in all branches of transport. In any case, the institute of compulsory insurance of passengers in all branches of transport, both on an international and EU level, the passenger is significantly protected and very likely that his damage will be fully recovered. The liability insurance institution for the damage caused to the passenger derives from the need to protect not only the injured passenger but also the carrier with respect to the contractual liability of the contract of carriage of persons. Namely, its responsibility is prescribed by law with the possibility of limited liability, which is fully harmonized at the national, international level and EU regulations (Pictures No.1). The legal protection of the passenger is significantly strengthened by the insurance institute and gives the passenger the assurance that his damages will be settled. The compliance of these regulations provides for equality of all passengers and equal rights in all situations arising from the carriage of passengers.

Pictures



Picture 1. Representation of the limit values of liability of carriers in the air transport of passengers (values expressed in the currency: euro-on 3.4.2019). [15]

References

[1] Zakon o obveznom osiguranju u prometu, NN 76/13,152/14.
[2] Međunarodni ugovori, NN 1/08.
[3] Zakon o obveznim i stvarnopravnim odnosima u zračnom prometu, NN 94/13.
[4] Odluka o novčanim iznosima do kojih se ograničava odgovornost prijevoznika u zračnoj plovidbi u nacionalnoj valuti, NN 47/93, 37/95.
[5] Konvencija za izjednačavanje nekih pravila u međunarodnom prijevozu zrakom (Montrealska konvencija), Zbornik Pravnog fakulteta u Zagrebu br.1(2004),str. 203-224.
[6] Radionov, N.; Ćapeta T.; Marin J.; Bulum, B.; Kumpan, A.; Popović N.; Savić I. (2011). Europsko

prometno pravo, Pravni fakultet Sveučilišta u Zagrebu, ISBN 978-953-270-054-1, Zagreb
[7] Kaštela, S.; Horvat, L. (2008). Prometno pravo, Školska knjiga, ISBN 978-953-0-30373-7, Zagreb
[8] Direktiva Vijeća 90/314/EEC od 13. lipnja 1990 paket putovanja, paket odmor i paket ture provizija: Council Directive 90/314/EEC of 13 June 1990 on package travel, package holidays and package tours Commision, OJ L 158,1990.
[9] Uredba Vijeća (EEZ) br 295/91 od 4. veljače 1991 o utvrđivanju zajedničkih pravila za zanijekao-internat sustav kompenzacije u redovnom zračnom prometu Council Regulation (EEC) No 295/91 of 4 February 1991 establishing common rules for a denied-boarding compensation system in scheduled air transport, OJ L 36,1991.
[10] Uredba Vijeća (EZ) br 2027/97 od 9. listopada 1997 o odgovornosti zračnih prijevoznika u slučaju nesreće Council Regulation (EC) No 2027/97 of 9 October 1997 on air carrier liability in the event of accidents, OJ L 285, 1997.
[11] Uredba (EZ) br 889/2002 Europskog parlamenta i Vijeća od 13. svibnja 2002 o izmjenama i dopunama Uredbe Vijeća (EZ) br 2027/97 o odgovornosti zračnog prijevoznika u slučaju nesreće Regulation (EC) No 889/2002 of the European Parliament and of the Council of 13 May 2002 amending Council Regulation (EC) No 2027/97 on air carrier liability in the event of accidents, OJ L 140, 2002.
[12] Uredba (EZ) br 261/2004 Europskog parlamenta i Vijeća od 11. veljače 2004 o utvrđivanju zajedničkih pravila o naknadi i pomoći putnicima u slučaju uskraćenog ukrcaja i otkazivanja ili dugog kašnjenja letova i ukida Uredba (EEZ) No 295/91 Regulation (EC) No 261/2004 of the European Parliament and of the Council of 11 February 2004 establishing common rules on compensation and assistance to passengers in the event of denied boarding and of cancellation or long delay of flights, and repealing Regulation (EEC) No 295/91, OJ L 46, 2004.
[13] Regulation (EC) No 785/2004 of the European Parliament and of the Council of 11 February 2004 establishing common rules on compensation and assistance to passengers in the event of denied boarding and of cancellation or long delay of flights, and repealing Regulation (EEC) No 295/91, OJ L 46, 2004.
[14] Ćurković, M.; Jakovina, D. & dr. (2006). Novi propisi iz osiguranja-Zakon o osiguranju i Zakon o obveznim osiguranjima u prometu, Inženjerski biro, ISBN 953-6447-98-3, Zagreb
[15]www.hnb.hr/temeljne-funkcije/monetarna-politika/tecajna-lista/tecajna-lista

International Journal
VALLIS AUREA
Volume 5 • Number 1 • June 2019
ISSN 2412-5210

CONTENTS

Polytechnic in Pozega
STUDIA SUPERIORA POSEGANA
Vukovarska 17 • 34000 Požega • Croatia

DAAAM International Vienna
Danube Adria Association for Automation & Manufacturing
Karlsplatz 13/311 • A-1040 Wien • Austria

vallisaurea@vup.hr • vallisaurea.org

ISSN 2412-5210