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VISOKA ŠKOLA
"INTERNACIONALNA POSLOVNO-INFORMACIONA AKADEMIJA" TUZLA

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2nd INTERNATIONAL SCIENTIFIC CONFERENCE ON DIGITAL ECONOMY DIEC 2019

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Keynote paper

BLOCKCHAIN TECHNOLOGIES: CURRENT STATE AND PERSPECTIVES

Abstract

The development of the digital economy is changing the ways of modern business and the exchange of digital information. In the digitalization world, data and information are traded intensively and the need for securing the transfer of transactions across the network arises. Consistent integrity of data and records in modern distributed information systems can be achieved using blockchain technologies. Blockchain applications are based on distributed ledgers, cryptography, consensus protocols and smart contracts. In this paper, we will give an overview of blockchain technologies and the possibilities of their application in electronic commerce, healthcare, education, agriculture, industry, traffic, telecommunications, administration and other fields. In particular, the application of blockchain in social networking, crowdsourcing and crowdsensing services will be 1ttack1a. The focal point of the analysis will be new business models, challenges in implementation, regulations and development trends. The aim of the paper is to point out the possibility of using blockchain technologies in distributed e-business systems and shared economy applications.

Keywords:*blockchain, blockchain technologies, blockchain in e-business, blochchain in IoT*

1. Introduction

The development of the digital economy is changing the ways of modern business and the exchange of digital information between people. In order to establish a safe and secure transaction transfer, the blockchain concept is applied. Originating from the cryptocurrency context (Nakamoto, 2008), the blockchain has been changing socio-economic flows and services, as well as systems of conducting transactions.

The application of blockchain technologies requires a reliable and scalable infrastructure. Such infrastructure should enable the unobstructed and secure exchange of large amounts of transactions. The transactions can be realized within a public, private or consortium blockchain using appropriate protocols. Also, since blockchain is based on the principle of verification and validation, it is necessary to use consensus algorithms and smart contracts.

This paper 1ttack1a the state and perspectives in the development of blockchain technology. The basic concepts of blockchain technology, blockchain data model and the possibilities of their application in the domains of e-commerce, industry, smart environments, traffic, and health are presented.

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2. Blockchain

2.1. The concept

Blockchain technology uses cryptographic techniques to provide consistent integrity of data and records (Agrawal et al., 2018). Essentially, blockchain is a complex mathematical algorithm aimed at maximizing the security of financial transactions using cryptographic methods. It is based on a distributed database, which consists of encrypted data that cannot be changed or copied, and which enables the undisturbed verification of transactions. The transactions are exchanged between different nodes in a decentralized peer-to-peer (P2P) network, where they are validated and "chained" into a blockchain. In this way, blockchain provides a distributed, unchangeable, transparent and secure ledger in which all transactions of money are reliably recorded (Rivera & van der Meulen, 2016). Each transaction represents a single block, with blocks being connected by a chain (Díaz, Martín, & Rubio, 2016). The significant role in the blockchain system have the so-called miners who, every time a transaction initiator sends a notice that they want to execute the transaction, use the cryptographic algorithms to generate the appropriate number for the confirmation and validation of the transaction (Reyna, 2018).

2.2 Consensus algorithms

Consensus as a notion constitutes unanimous decision-making. In a blockchain context, this term is based on the principle of verification and validation. The consensus is a synchronized process that encompasses transactions and keeps track of them at the network level. When the transactions are verified, the ledger is updated. There is a large number of consensus algorithms which are based on different principles but have the same goal. Frequently used consensus algorithms in cryptographic systems are (Halpin & Piekarska, 2017; Zheng et al. 2017):

- Proof of Work (PoW). The most frequently used algorithm in cryptocurrency systems. The user receives a task to solve. Proving and validating the solution gives access to the network and prize in cryptocurrencies. The advantage of this algorithm is that it allows anyone to mine, but it requires huge energy consumption. Cryptocurrencies using these algorithms are Bitcoin, Bitcoin Cash, Ethereum, Litecoin, GameCredits.
- Proof of Stake (PoS). PoS uses a deterministic way of choosing the creator of a new block, depending on its wealth (stake). This algorithm does not require mining. Cryptocurrencies using these algorithms are DASH, NEO, Cardano, QTUM.
- Delegated Proof of Stake (DpoS). It is a consensus algorithm maintaining irrefutable agreement on the truth across the network, implementing a layer of technological democracy to offset the negative effects of centralization. Cryptocurrencies using these algorithms are Bitshares, Steem, EOS, Lisk, Ark.
- Proof of Importance (PoI). Proof of Importance is a major innovation in the blockchain industry introduced by NEM. It is a novel algorithm that uses network theory to assign a rating of each account's importance in the network.
- Proof of Capacity (PoC). The algorithm is similar to classical mining, except instead of power it requires memory consumption. Cryptocurrencies using these algorithms are Burstcoin and SpaceMint.
- Proof of Burn (PoB). Miners send coins to an unspendable address (also known as an eater address), effectively burning them. Once coins are burned, they cannot be accessed and spent again.
- Tangle. IOTA, a cryptocurrency network developed as a distributed public ledger, uses a specific structure called the Tangle, a directed acyclic graph structure, to store transactions occurring on the public ledger. It is described as the successor of the blockchain, allowing small-sized micropayments unlike Bitcoin, where fractional amounts of bitcoins are lying idle, as they cannot be transacted due to high miner fees.

2.3 Blockchain protocols

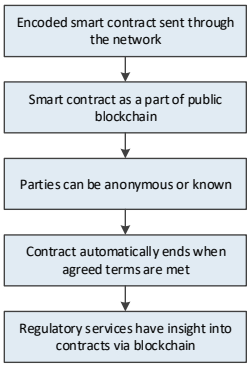
For the implementation of the transactions in the blockchain, the appropriate protocols based on one of the consensus algorithms are used. The most popular protocols used in blockchain are (Antonopoulos, 2014)(Reyna, 2018):

- Bitcoin. The protocol on which the cryptocurrency Bitcoin is transacted, this was the earliest of the blockchain protocols. It is an open-source protocol and has the following features: cryptographic hash function, digital signature, P2P, PoW consensus algorithm and encrypting of the public and private key (Nakamoto, 2008).
- Ethereum. It has the same features as Bitcoin and it is used by the Ether cryptocurrency. Ethereum provides a blockchain platform, where developers can launch their own blockchain projects, including their own cryptocurrencies.
- Ripple protocol. Ripple was designed precisely to facilitate a swift and inexpensive global transfer of money. Ripple's native cryptocurrency XRP has the third highest market cap and is lower only to Bitcoin and Ether. It is becoming increasingly popular, with more and more banks and payments providers using RippleNet to send money globally
- Hyperledger. The Linux Foundation, and many other partners such as IBM, Intel, SAP, Cisco, Daimler, and American Express, formed Hyperledger consortium to design and develop enterprise blockchains. It is not suitable for cryptocurrencies.
- R3's Corda. This is another enterprise blockchain. Created for financial purposes and works with complex financial inquiries. Smart contracts in this protocol possess certain legal expressions, which give them legitimacy. It is not suitable for cryptocurrencies.

2.4 Smart contracts

Smart contracts are computational transaction protocols that implement the rules defined in the contract (Szabo, 1997). In Blockchain, a smart contract is part of a code that is automatically executed by the miners. They are used for a variety of purposes, and most often in the domain of banking services and the Internet of things (Christidis & Devetsikiotis, 2016). A large number of smart contracts are developed on Ethereum blockchain (Wood, 2014; Kosba at al., 2016). The simplified principle of smart contracting is shown in Figure 1.

Figure 1. Smart contract principle



2.5 Blockchain data models

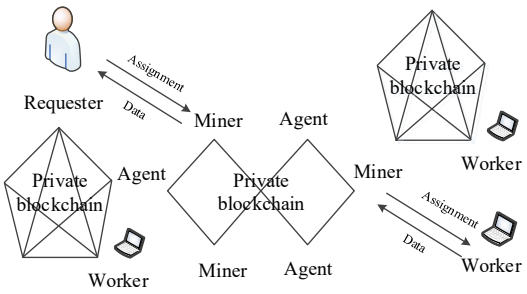
Blockchain data models are an essential part of a solution resolving the privacy issues. The four parties involved in the blockchain data models are (Yang at al., 2019):

- Miner. The ones in charge of validating new transactions and storing them in the global ledger.

- Agent. The agent works as a miner in a public blockchain and organizes a private chain. Collects assignments from the public block and publishes them in the private agent network.
- Requester. An assignment is released to the blockchain by the requester for the purpose of gathering information from certain locations, e.g. gathering sensor data using smart contracts in the blockchain.
- Worker. When an assignment is released, workers can download them and solve them. When the assignment is completed, workers are rewarded. All workers are anonymous.

Previously explained blockchain data model is shown in Figure 2.

Figure 2. Blockchain data model, adapted from (Yang at al., 2019)

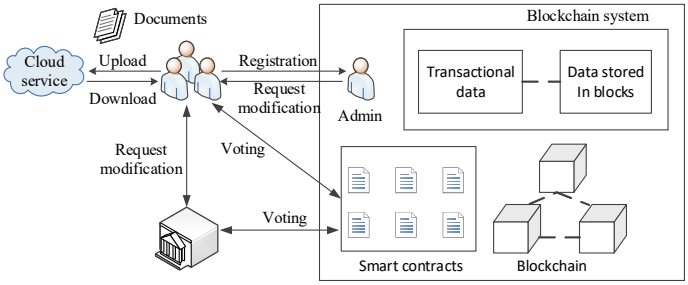


There are three types of blockchain (Reyna, 2018; Feng at al., 2019):

1. Public. It is organized as an open-source decentralized system. It can be used by anyone who wants to participate in basic activities within the blockchain network.
2. Private. The implementation of the private blockchain allows network access only to verified users. Unlike public blockchains, private ones are centralized and controlled by its users, who have permission to access the network and maintain the main ledger.
3. Consortium. The consortium blockchain regulates the consensus process in advance with a selected set of nodes (e.g. hyperledger).

Blockchain access model is shown in Figure 3 (Zhu, Wu, Gai & Choo, 2019).

Figure 3. Blockchain access model, adapted from (Zhu, Wu, Gai & Choo, 2019)



3. Managing blockchain transactions

To manage blockchain transactions it is important to provide the scalability, performance, interoperability, security, privacy and trust in the blockchain.

The network, like any system, allows access to new users. The ability of the network to support an increase in the number of users represents its scalability. Depending on the type and size of the

network, each network responds and solves differently the problem of scalability. The scalability and performance of the blockchain system are determined on the following basis (Li et al., 2017):

- Data size. Depending on the cryptocurrency, the size of the blocks that generate transactions varies. Transactions continue, records grow, and all this leads to a constant increase of blocks, which in the future can create a network problem.
- Response time. Due to the daily increase in the number of users and the number of transactions they perform, it is necessary to reduce the waiting time, adjust the response time and improve it in order to enhance the performance.
- Price. Increasing the number of users, transactions, and traffic in general leads to increased costs. Miners show a tendency towards jobs with higher fees and generate constantly higher costs for the network that needs to be regulated.

Interoperability is the ability to openly share information across all parts of the blockchain network. As each network has its own smart contract of different complexity, the problem of mutual communication arises. The solutions to this problem are categorized with the following (Li et al., 2017; Reyna, 2018):

- Open protocols. They provide a universal language and function as standardized blockchain paths. The most famous protocols of this type are atomic replacement protocols, which function on the principle of exchange between blockchain without intermediaries. Another type of protocols is Interledger, which includes senders, connectors and recipients and consists of 4 layers: application, transport, interledgerand ledger layers.
- Multi-chain Frameworks. They are based on decentralized management and the tokens they use. They represent environments that help facilitating open communication and transfer of values and data between networks. The most familiar framework of this type is Polkadot based on the following parts: relay Chain, parachain, bridges.

To protect privacy, blockchain needs to meet the following requirements: (1) links between transactions should not be visible, and (2) the content of transactions is known only to their participants.

4. Blockchain application domains

Cryptocurrencies represent the most common blockchain application domain. In this paper, examples of using blockchain in e-business and smart environments will be presented.

4.1 Blockchain in e-business

For online businesses, it is important to monitor consumer behaviour and determine their preferences for certain products and services. Also, the analysis of consumers who buy online is important for determining the recency, frequency and monetary values achieved for each transaction.

Using blockchain enables content customization for consumers. For example, blockchain browser Brave, based on Basic Attention Token platform. The Brave browser can automatically track which web sites would be interesting to the user. Tokens are awarded to advertisers when their ads appear and to users who decide to see the displayed ads. (Siu, 2018). This approach is suitable for the following stakeholders:

- marketers get better performance data on their ads,
- publishers receive more revenue and control over ads they display,
- consumers get fewer ads, but with better quality, which are relevant to their interests, without compromising their personal data, thanks to blockchain encryption.

Blockchain technology is designed to recognize and understand false ads, using its distributed database system. One of the blockchain-based solutions that address this issue is the company called Adchain, which controls the entire supply chain of digital ads by following clicks, geographic locations, purchasing and segmentation of target groups (Warren, 2018).

Blockchain can also be applied in the industry. In this way, consumers can get a complete insight into the process of product development, its origin and value. One example of using blockchain in the fashion industry is the Babyghost fashion brand that uses the blockchain VeChain platform that allows you to verify the authenticity of an item.

Some companies, such as OrionCoin, use blockchain to create platforms for loyalty programs. Blockchain is used to supply companies and their customers with loyalty points that are equivalent to cryptocurrencies. Loyalty points can be spent within the network, depending on the implemented loyalty program. By implementing blockchain, loyalty programs would help marketers keep more customers in the long run (Siu, 2018).

Blockchain technology also has the potential to change the way social media operates. Two leading companies in the blockchain of social media are Nexus and Synereo. Through Nexus social media platform the user can set up information, send private messages, create public transactions, sales, and crowdfund. The Nexus cryptocurrency called Social is used to buy goods and services within the platform. It connects with a debit card and allows spending Social as a currency. Synereo allows customers to monetize their content on social media. This company created a system called WildSpark that uses blockchain technology to make payments to its users with their AMP cryptocurrency (Warren, 2018).

4.2 Blockchain in smart environments

Blockchain technologies play a significant role in the development of smart environments. Environments in which the concept of the Internet of Things (IoT) is implemented in order to improve the quality of life and simplify the activities of users are called smart environments (Cook & Das, 2005; Gubbi, Buyya, Marusic & Palaniswami, 2013; Radenkovic et al. 2017). Internet of Things is a technology that allows intelligent devices to connect to the Internet with the possibility of M2M communication (Gubbi, Buyya, Marusic & Palaniswami, 2013; Radenković et al., 2017). As the number of smart devices connected to the Internet exponentially increases, the ability to send, receive, collect and 6ttack6 data from any device at any time rises as well.

The future of the IoT system depends on becoming a self-regulatory and self-governing decentralized system (Tao, Li, Sun &Cai, 2017). Such a transformation that will enable scalability, reduced infrastructure costs, autonomy, user privacy, and access control can be achieved by using blockchain technology.

The basic security problem of the IoT system is working in a trustless environment. Data from the sensors are widely distributed in public places without protection against unauthorized access to data (Arias, Wurm, Hoang & Jin, 2015). In order to protect the network from attack, IoT systems must verify the authenticity of the device before they are added to the network. IoT devices should also be resistant to unauthorized hardware and software change. Figures 4 and 5 present the security requirements of the IoT system of the smart environment and the required performance, respectively (Makhdoom, Abolhasan, Abbas & Ni, 2019).

Figure 4.Security requirements of the IoT smart environment system (Makhdoom, 2019)

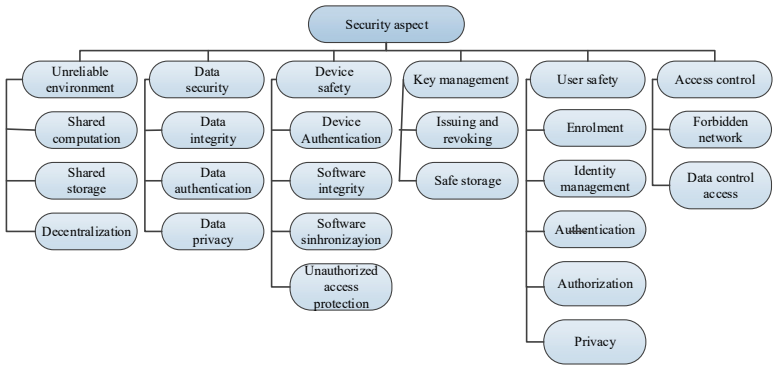
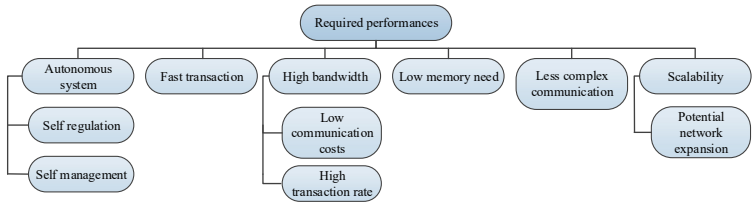


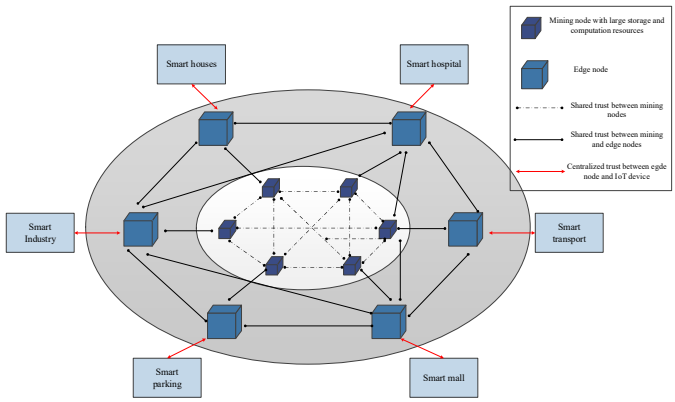
Figure 5. Required performances of IoT smart environment system, adapted from (Makhdoom, Abolhasan, Abbas & Ni, 2019)



Blockchain can be used to set up policies, control, and monitor the rights to access user/sensor data and independently perform various actions based on pre-defined conditions using performance smart contracts (Makhdoom, Abolhasan, Abbas & Ni, 2019).

The increase of population in urbanized cities increases the pressure in these areas in terms of disruption of scalability, latency, network usage bandwidth, data privacy and security. In the new architecture, it is necessary to provide smart city applications for lowering latency and rising mobility, protecting information that is transmitted from unauthorized access or cyber attacks and provide tolerance to errors. In order to achieve efficiency and scalability in trust management of the IoT network, Kim & Lee (2017) introduce the concept of globally distributed and local centralized trust management. Hybrid architecture for a scalable smart city network with blockchain and software defined networking (SDN) is proposed to overcome the limitations of the current architecture of smart cities (Figure 6) (Sharma & Park, 2018).

Figure 6. Hybrid smart city architecture based on blockchain and SDN, adapted from (Sharma & Park, 2018)



In the proposed model, a smart city grid is divided into two different groups using blockchain technology: core and edge grid. The core nodes of the grid represent high-computing mining nodes with resource storage, while the edge nodes have limited storage and computational power. Each node is provided with an SDN controller to achieve high agility and security, and to reduce hardware and management costs. The distributed nature of the proposed model limits the impact of the attacks, or if the edge node is compromised, the resulting effect must be limited to the local area.

In a smart city, IoT devices generate a large amount of data and require real-time processing. In the proposed model, edge nodes offer real-time processing with low latency, offering filtered information on raw data. When the data is previously processed, the edge nodes transmit encrypted data processing into the core of the smart city network. Mining nodes in the core of the grid will further 8ttack8 the processed data, make decisions, validate and verify PoW, and generate blocks. In order to ensure the integrity of stored data in the primary grid, a digital signature and unchangeable hash are used for blockchain storage.

4.3 Blockchain in smart transport

Security communication protocols for vehicles are based on mobile and IT standard security mechanism that is not up-to-date and is not suitable for applications of intelligent transport systems (ITS). Blockchain technologies are used to achieve secure communication within the ITS. The functions of the ITS blockchain are shown in Figure 7 (Singh & Kim, 2018).

Blockchain can be used to exchange data collected from traffic and store it in public ledgers. Using a blockchain, the car can sell this information to other cars and make a cryptocurrency in exchange. Using a blockchain for each vehicle, information about its origin, ownership, registration, traffic violations, vehicle insurance, etc. can be stored.

When purchasing any intelligent vehicle, an intelligent vehicle-trust point (IV-TP) and unique vehicle crypto code are obtained (Singh & Kim, 2017; Singh & Kim, 2018). IV-TP is an encrypted unique number that is assigned to every intelligent vehicle and is called an IV-TP ID generated by an authorized authority. With this point, it is possible to access the complete history of the vehicle (history of accidents, vehicle condition, history of violations, etc.). The scoring system within IV-TP is shown in Figure 8.

Figure 7. ITS blockchain functions, adapted from (Singh & Kim, 2018)

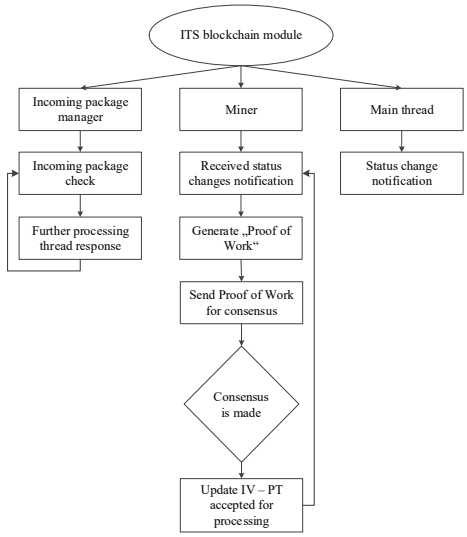
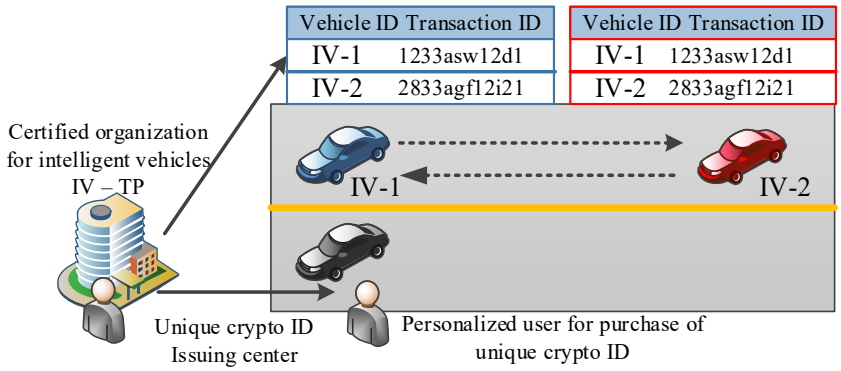


Figure 8.IV-TPscoring system, adapted (Singh & Kim, 2018)



4.4. Blockchain in smart healthcare

Blockchain technology has great potential for providing security, privacy, decentralization, and invariability in Healthcare Information Exchange (HIE) due to the characteristics that it features (Reyna, 2018; Rahurkar, Vest & Menachemi, 2015). Use cases of blockchain in healthcare can be (Figure 9)(Stewart, Fernandes, Rodriguez-Huertas & Landzberg, 2010; Kierkegaard, Kaushal & Vest, 2014; Gordon & Catalini, 2018):

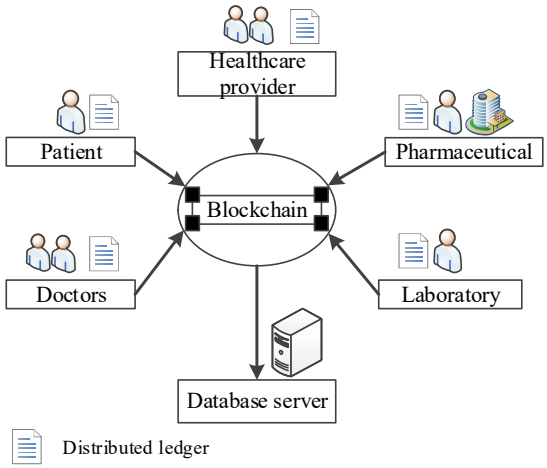
1. Clinical data exchange. Electronic Health Record (I) and Electronic Medical Records (EMR) contain critical and sensitive medical information about patients, which should be secured, processed and stored in a safe place. This kind of critical data sharing requires high transparency and accountability during data transactions.
2. Global data exchange. If patients need medical assistance abroad, doctors need information about the patient's health status, which can be obtained through global data exchange with the consent of the patient.
3. Maintaining medical history.
4. Research and clinical trials. Large amounts of data are processed in clinical trials, which need to be preserved somewhere. Blockchain allows the processing of this data and monitoring of each phase of the test with an analysis of changes that occur.
5. Health data access control. Blockchain provides patients with safer and safer access to medical data by only authorized entities, doctors and certain medical personnel.
6. Drug supply chain management. Blockchain provides security and integrity of the whole process. Allows monitoring of drug procurement, the condition of medicines on the stock, and information on medicines to be procured.

In healthcare, the interoperability and secure data exchange gives many benefits (Stewart, Fernandes, Rodriguez-Huertas & Landzberg, 2010; Gordon & Catalini, 2018):

- Interconnected systems can improve efficacy, reduce the time spent for administrative activities and speed up diagnostics and treatment delivery.
- Interoperability can reduce the number of repeated clinical tests, diagnostic procedures and interventions, by providing the data when necessary.

Before the actual data exchange between institutions, there need to be made data exchange agreements, procedures and rules (Adler & Stead, 2015). Patient-centred interoperability will require new procedures for processing and management of private data.

Figure 9. Blockchain in smart healthcare, adapted from (Kumar et al, 2018)



Blockchain can offer different levels of privacy, anonymity or transparency in healthcare data. Possible approaches are (Gordon & Catalini, 2018):

- Rules for digital access. All patient data is crypted with the patient's public key. Patient can manage their public keys with a wallet-like application.
- Data aggregation. A patient can access a joint healthcare portal and provide their blockchain data to all the institutions within the portal. In addition, data from different institutions can easily be aggregated.
- Real-time data. Clinical data may be time sensitive. Accessing the data in blockchain enables healthcare providers to have the accurate data when needed.
- Consistency. Clinical data and metadata can be securely shared across healthcare institutions, providing full patients records in time.

5. Conclusion

This paper presents the state and perspectives in the application of blockchain technology in the domain of e-business, industry, smart environment, traffic and health. Different models of blockchain application in the mentioned domains have been presented. The need for blockchain infrastructure is described which is scalable and interoperable for the purpose of a more efficient and secure realization of transactions.

The future directions of development relate to the development of new business models, services and blockchain applications that can be applied in different domains of modern business. Significant future applications are expected in the domains of e-business, IoT and healthcare.

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Domagoj Sajter, Associate Professor[1] *Keynote paper*

UNBLOCKING BLOCKCHAIN POTENTIALS

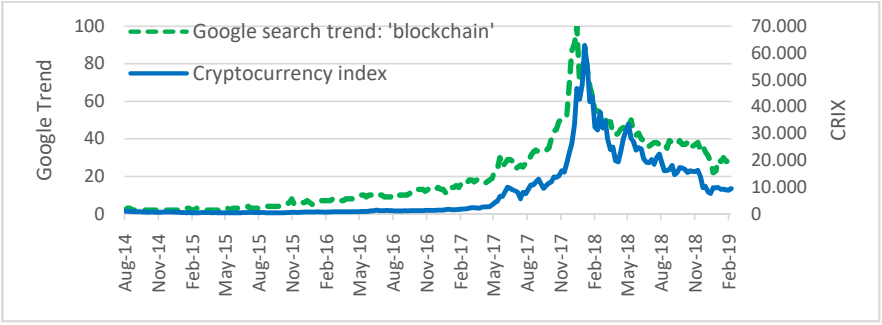
Abstract
The goal of this paper is to research and present the current developments and future prospects of the blockchain technology throughout economy. Since it was introduced within the Bitcoin, blockchain became a buzzword repeated everywhere, often a proposition of panacea for the global problems. However, in the meantime the world of cryptocurrencies experienced a typical boom-bust cycle which many left wandering if blockchain technology was anything more than a hype. This paper aims to establish a brief overview of the possible implementations of distributed ledger (blockchain) technology in the context of the fast growing information society: blockchain may be the essential tool in the economy based upon Internet-of-things, new mobile connectivity standards and big(ger) data.

Keywords: *Blockchain, distributed ledger, information society*

1. Introduction

Blockchain is among the top buzzwords of the economy in the past couple of years. Worldwide interest for the term 'blockchain' on the Google search engine strongly correlates with the cryptocurrency index CRIX, which is not surprising given the stellar growth of the Bitcoin, Ether and other major cryptocurrencies (Graph 1). The impressive progression of cryptocurrencies during 2017 drew attention for the technology and architecture behind them and fuelled interest to the innovative concept of writing, storing and sharing data.

Graph 1. Cryptocurrency market index vs Google search trend for 'blockchain', 2014-2019



Notes:Google Trends line represents search interest for the term 'blockchain' relative to the highest point on the chart worldwide during the last five years (2014-2019); a value of 100 is the peak popularity for the term, while 50 means that the term is half as popular.
The CRIX is a cryptocurrency market index where the number of constituents is determined by analysing Akaike and Bayesian information criterions for multiple alternatives of the index, and where each cryptocurrency is weighted with its market capitalization.
Sources: Google Trends and CRIX.de

Those who reflect on the blockchain with (some) knowledge of its peculiarities argue in favour of its potentials; many others who are unacquainted with hashes, nonces, public-key cryptography and

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other similar "oddities" believe it to be just another passing fad, ripe for oblivion together with the cryptocurrencies' spectacular crash of 2018. It is a trigger-word often inciting emotive reactions, especially with those that gained and/or lost considerable amounts of money with cryptocurrencies.

Regardless of the stance towards the crypto-universe it is only natural to be fascinated by the spectacle of the 01/2017 - 01/2019 crypto boom-bust cycle. What remains, if anything? Eurostat[2] and Fred[3] were queried in February 2019; both sides of the Atlantic had no available data on the keyword 'blockchain'. Is it that the new technology has not yet settled and supplied enough documented statistics, or is digital static all that' s left?

The purpose of this paper is to present the novelty of blockchain technology and to discuss both its present merits and its faults from a non-attached, independent standpoint, away from the emotive reactions of crypto-evangelists and Bitcoin obituaries' writers[4]. Will it really change everything or will it go down in history? As always with such radically opposing and borderline alternatives the road is somewhere in the middle – of course – but to which border is it closer? This paper chooses its risks wisely and halts at the epistemological frontier of knowledge about the society in the future.

After the introduction, the next – second – chapter defines and explains the main pillars of blockchain and the disambiguation between blockchain and distributed ledger, as well as the blockchain as a trust-building mechanism. The third chapter sets the stage for possible implementations and developments of the blockchain technology by providing wider context of the information society we live in, together with the new developments of the information communication technology. Finally, fourth chapter concludes.

2. Blockchain and trust

Deloitte surveyed 1053 respondents knowledgeable of blockchain across seven countries globally, from ten industries, and two thirds of them said that their company will spend more than 1 million USD investing in the blockchain technology during the next year (Deloitte, 2018, p. 18). This is an indication of the non-triviality of the momentum cryptocurrencies have made.

On the other hand, it is sometimes difficult to assess whether the investment into blockchain is a "true" venture into new technology or a covert marketing expenditure trying to implant an image of a corporation willing to explore cutting-edge ideas. This adds to list of reasons why it is important to understand what blockchain is and what it proposes.

Oxford Dictionary defines blockchain as "*a system in which a record of transactions made in bitcoin or another cryptocurrency are maintained across several computers that are linked in a peer-to-peer network*" (Oxford Dictionaries, 2019). Acknowledging that every definition is always a trade-off between brevity and accuracy, the previous explanation provides only indications of what blockchain is, does, and could be. The most cited article on both Web of Science and Scopus databases regarding blockchain (199 and 324 citations in February 2019, respectively) portrays it as "*a distributed data structure that is replicated and shared among the members of a network*"; "*a log whose records are batched into timestamped blocks*" (Christidis & Devetsikiotis, 2016, p. 2293).

A comprehensive description of blockchain includes (at least) four elements: it defines it as (1) a data structure, (2) an algorithm, (3) a collection of technologies, and (4) a generalization of distributed peer-to-peer systems with a common application area (Drescher, 2017, p. 33).

Data structure relates to the concept of arrangement of data within entities named as *blocks*, whereas blocks are connected between themselves in an ordered sequence (*chain*). Linking blocks

[2] https://ec.europa.eu/eurostat/
[3] https://fred.stlouisfed.org
[4] Reference to https://99bitcoins.com/category/bitcoin-obituaries/.

is done via cryptography which ensures immutability of the data within. In simple terms, cryptography is here used primarily for two purposes: (a) to "lock" the data within the blocks (to make the data unchangeable and/or private, hidden to outsiders), and (b) for trustworthy and reliable assignment of identities behind the data (digital signatures). The data of the first blockchain – Bitcoin – consists of transactions, where one party sends valuable information (which crypto-proponents equate to money[5]) to the other, through internet, where every malevolent person could alter or steal the contents of that transaction.

Having seen that the Bitcoin system functions the idea evolved with the notion that the data within blocks can be something other than transactions – whichever "valuable information" (Dujak & Sajter, 2019, p. 26) that may be. The data structure is also described as a *ledger*; 'distributed ledger technology' is often used as a synonym to 'blockchain technology', especially with those who seek to distance themselves from the cryptocurrency subculture and its worldviews[6].

Closely related to the data structure, an 'algorithm' refers to an unambiguous sequence of commands, which as an output frequently builds up aforementioned data structures – blocks. Developing and maintaining blockchain requires a common set of rules which users abide by; these rules are encoded in the algorithm which is often referred to as "the law" (Lessig, 2000).

Combining data structure with the algorithm and underlying cryptographic models broadens the concept of blockchain and extends it to a collection of technologies with similar traits.

Lastly, a blockchain can be viewed as a generalization of distributed, decentralized systems with a common application. The keywords here are distribution and decentralization: in a globalized economy founded upon the information flows one of the vital actual questions is how to reach a consensus without a common authority. Internet is by itself a global network without a main, central hub, without continental or even regional core points. It is a collection of dispersed nodes, open for communication, which makes them vulnerable to all kinds of attacks. Conceiving both a data structure and a protocol for sending and receiving, storing and changing valuable information on such a flat, level playing field is an innovation worthy of its "buzz".

Given that the main pillar of the blockchain is its ability to attain agreement on a peer-to-peer level much of the confusion and controversy regarding the notion of blockchain stems from abandonment of aforementioned proposition, a proposition which was central to crypto-enthusiasts. Evolution of blockchain lead it to the crossroad at which the basic, rudimentary typology emerged: blockchains can be public or private (Bashir, 2018).

Public blockchains are "classic, traditional" systems open to everyone, where no permission needs to be given from the existing participants to the admission of the newcomer; he only needs to adhere to the established protocol in order to join. This also means that the identity is irrelevant since anyone can participate –screening individual traits is pointless as there are no gatekeepers. The only prerequisite is adherence to "the law" – the software code within the protocol.

Private blockchains are the opposite: they are permissioned (only selected entities can be members) which means that a blockchain only enhances certain pre-existing level of trust. As such, private

[5] One can notice a reluctance in calling Bitcoin "money". This is because even though it is an innovative and promising concept it only anecdotally fulfils three main functions of money: Bitcoin is not a widely accepted medium of exchange, nor it is a unit of account, and it certainly is not a stable depository of value over time. This could however change in the future, but that would require large scale adoption and a redesign of current payment systems.

[6] The origins of Bitcoin are embedded in the cypherpunk movement, which could be correlated to cyber-anarchy (Narayanan, Bonneau, Felten, Miller, & Goldfeder, 2016, p. 247). One of the predecessors of Bitcoin is *b-money*, concept developed by Wei Dai in 1998. Dai starts his essay with the following statements: "*I am fascinated by Tim May's crypto-anarchy. Unlike the communities traditionally associated with the word "anarchy", in a crypto-anarchy the government is not temporarily destroyed but permanently forbidden and permanently unnecessary*." (Dai, 1998) If we would maintain that ideas and beliefs are the essential drivers of human actions, if the cryptocurrencies were to become mainstream the ideas and beliefs behind them would also need to become mainstream. With cypherpunk this is certainly not the case.

blockchains lack the fundamental novelty of its Bitcoin predecessor, which is why many oppose to the very notion of private blockchain and why the phrase "distributed ledger technology" became widespread. Without decentralization it becomes difficult to find the unique selling point of a private blockchain, because a simple (and free) Google Sheet (e.g.) does almost all the work: it is a shared database, saved online, with dedicated passwords for viewing and editing, recording all logins and changes to it.

There is also a third path: somewhere in between. A blockchain-based system can have both permissioned and permissionless sub-zones where different permissions (for reading/writing data, proofing, upgrading protocol, as well as granting and revoking authorities for these activities, etc.) can be given to certain groups, even to the public[7]. This is where presently blockchain hold most of its potential.

The essential innovation of the blockchain technology is its proclaimed ability to generate the "glue" that holds the economy together: trust. In a capitalist economy money can buy almost anything, but not trust[8]. The core element of trust building within any blockchain is math; at the basic proficiency in math language 2254789 x 3325548 either is or isn't 7498409049372. The calculus is easily provable, and after proofing "trust" is established that indeed 2254789 times 3325548 equals 7498409049372. Cryptography could be regarded as a branch of mathematics where the following principle is heavily used: it is very easy to determine as true that a x $b = c$, but it takes much more time and effort to start backwards, with the product (c = 7498409049372), and to find which two seven-digit numbers (a, b) were multiplied in order to provide that solution. Cryptography uses powerful functions which are very easy to prove if one has the information in advance, but are practically impossible to solve backwards[9]. This property allows them to be used in the context of maintain data integrity, proofing ownership over data and exchanging data securely over unsafe communication channels, which are crucial in the internet today.

However, "trust" here has only one necessary component because it is only ex-post maintained: in the context of blockchain it merely declares that the outcome of an algorithm with known set of variables, parameters and rules is true or false, which hardly qualifies as trust. In the non-virtual world trust also has an ex-ante notion: it is a belief that under unknown future circumstances (indefinite set of variables and parameters, but known rules) the outcome of a series of events (algorithm) will be equal to anticipated. The trust as a prerequisite for the functioning economy is also forward looking; it is a consciously accepted risk (under condition of uncertainty) that the future consequences of the risk acceptance will not be disappointing. It is a leap into unknown which is only party simulated in the crypto domain, where the sole trust cryptography can provide us with is (somewhat simplified) that in the future only the holder of the right keys can handle the data locked/signed with that keys. However, the trust is needed beyond that: one needs to believe that the blockchain system will persist and be active, that developers will maintain the code, that intermediaries will survive (presuming that the user is not skilled as a blockchain developer) and provide service, that regulation will not change radically, etc. Hence, the core assumption that trust in the civilization could somehow be coded into software is only partially established with the novel ledger technology.

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[7] For instance, public could be given right to read the data, group A could write to database, group B could do the proofing, and group C could give subsections of both groupa A and B right to update the protocol.

[8] If an entrepreneur somehow cheats its business partner no money in the world can restore their relationship to its previous state. Money can mend superficial relationship and be a component of the restoration, but money alone cannot change beliefs.

[9] Schneier provides a vivid example: „*A typical supernova releases something like 10^51 ergs* [erg is an unit of energy equal to 10^−7 joules]. *If all of this energy could be channelled into a single orgy of computation, a 219-bit counter could be cycled through all of its states. These numbers have nothing to do with the technology of the devices; they are the maximums that thermodynamics will allow. And they strongly imply that brute-force attacks against 256-bit keys will be infeasible until computers are built from something other than matter and occupy something other than space*." (Schneier, 2015, pp. 157–158)

3. Information society and leaps in the development of ICT

In 2018 worldwide each minute, every day, approximately 160 million of emails are sent, 13 million SMS (text) messages are delivered, and Google conducts 3,9 millions of searches; by 2020 it's estimated that for every person on earth 1,7 MB of data will be created every second (Domo Inc., 2018). Handling the enormous and growing amounts of data will require novel systems, and blockchain stands here as a potential framework – a blueprint for the future data management technologies.

It could be argued that people created vast amounts of data since the beginning of civilization, but that data was not (for the most part) stored anywhere and it was lost either immediately, or over time. Nowadays Wi-Fi passwords are stored even in lightbulbs (see Table 1.), and people leave digital traces in whatever they do and wherever they go. Most of the digital services regarded as "free" (because they are not paid with money directly; e.g. browsing the web, e-mail communication, social networks, etc.) are funded indirectly by the data we leave behind while using these services. Even though the data created could be seen as merely noise, powerful AI systems can detect patterns within, which makes them potentially valuable. Since almost no one actually reads the contracts we sign when we register for these services and that they are in fact unreadable (Benoliel & Becher, 2019), it shouldn't come as a surprise that our private data gets leaked, sold and resold, and used in ways we never could foresee.

With the purpose of giving illustration to the previous statements, a miniature ad-hoc "research" has been performed. News was collected from well-known and widely used internet outlets regarding issues of consumer privacy. The extent of the research spans over three months (from the beginning of November 2018 to end of January 2019); 26 articles during that period were found which expose various malfeasances with user data (Table 1.). Many blockchain enthusiasts intend to take back control of both the underlying data and the systems which create and manage that data.The processes of data creation and high-speed communication are expected to escalate to a new level. Among others, two noticeable (and intertwined) advancements are anticipated. The one is the proliferation of a new category of data creators in the realm of internet-of-things – devices and objects packed with sensors, cameras, microphones, machine learning / artificial intelligence software, etc., connected to internet and communicating between themselves. The ability to collect real-time data could provide businesses and consumers with a number of benefits, allowing automation of processes, rising productivity and enhancing customer service. The second is the new standard of mobile communication which will serve as a highway for distribution of all the new (and "old") data. Fifth generation of mobile infrastructure (5G), expected to be perfected in 2020, will expectedly provide a massive leap in not only speed, but also capacity, cost reduction, and traffic. Expectations are very high and even if the providers under-deliver the change could still be substantial. These leaps will most likely indicate a new era of ICT and data management.

However, one of the difficult tasks will be to provide proper levels of security and privacy: creating and sharing all that data could easily become disturbing if confidentiality controls were not put in place. One of the main contributions of Bitcoin and blockchain in general is in directing attention to powerful cryptographic tools which can protect both privacy and security – values which are in high demand lately:

"*The recent increase in reported incidents of surveillance and security breaches compromising users' privacy call into question the current model, in which third-parties collect and control massive amounts of personal data.*[…] [T]*rusted, auditable computing is possible using a decentralized network of peers accompanied by a public ledger*." (Zyskind, Nathan, & Pentland, 2015, p. 180)

Farsighted but concrete projects such as Hyperledger, IBM's Blockchain World Wire, Microsoft's Azure Blockchain Workbench, Alibaba Cloud's Blockchain as a Service, Amazon's Quantum

Ledger Database, JP Morgan's Coin – among many others – signal that blockchain technology could be here to stay, regardless of the cryptocurrency haze.

Table 1. Malfeasances with user data: online news from Nov-2018 to Feb-2019

Publisher of the news*	Shortened link to the news	"Perpetrator/-s"	Deed
Washington Journal of Law, Tech and Arts	tinyurl.com/yxqrjmul	Amazon	Consumer generated mass surveillance
Business Insider	tinyurl.com/y3be8jk6	Amazon	Spying/tracking users
Financial Times	tinyurl.com/y2yzzh2n	At least 34 apps (games, etc.)	Selling user data to Facebook
New York Times	tinyurl.com/y7lry8rw	At least 75 companies	Spying/tracking users
Techcrunch	tinyurl.com/y9h3ky78	Facebook	Spying/tracking users
35th Chaos Communication Congress	tinyurl.com/y3ja6w83	Facebook	Tracking and selling user data even if user doesn't have FB account or app
Ars Technica	tinyurl.com/y3yby6ya	Facebook	"Knowingly violated" privacy laws
The Verge	tinyurl.com/yckq85tt	Facebook	Spying/tracking users
Wired	tinyurl.com/y7o9muqb	Facebook, Instagram, WhatsApp, Messenger	Sharing user data
Business Insider	tinyurl.com/y7e9gbcm	Google	Creating "bubbles" by filtering search results
Deutsche Welle	tinyurl.com/yyazassz	Google	Privacy breach
Techcrunch	tinyurl.com/yaopxlop	Google	Spying/tracking users
Medium	tinyurl.com/ydfmnbpe	Google	Spying/tracking users
Medium	tinyurl.com/yyjwzjh7	Google	Spying/tracking users
The Intercept	tinyurl.com/yagqxlh7	Google	Spying/tracking users
Business Insider	tinyurl.com/y3jb37ac	Google	Secretly putting microphones in devices
Search Engine Journal	tinyurl.com/y4uayhns	Google, Facebook, Twitter	Disrespecting the "Do Not Track" setting on web browsers
Bruce Schneier	tinyurl.com/y8yy9eh9	Government/-s	Placing surveillance cameras in streetlights
Wired	tinyurl.com/y7r24mel	Governments	Spying/tracking citizens
Fair	tinyurl.com/yyg47urs	Governments	Potential misuse of face recognition
Motherboard	tinyurl.com/ya25y9wx	Hundreds of free apps	Tracking and selling user data
Boing Boing	tinyurl.com/yadvbxyv	Lifx	Passwords saved insecurely (in a lightbulb)
Bloomberg	tinyurl.com/y9jzrjmf	Private DNA testing company	Leaking DNA data to FBI
Business Insider	tinyurl.com/ybjldmrg	Smart TVs	Tracking and selling user data
Bleeping Computer	tinyurl.com/y49o9jr5	Thousands of apps	Violating policies
Techcrunch	tinyurl.com/ycr4m3o5	Unknown	24 million financial and banking documents published online

**News published during the three month period from the beginning of November 2018 to end of January 2019*

Source: Author

4. Conclusion

The concept of blockchain seems to be an interest-inciting idea often thrown around ostentatiously with the aim of increasing brand and/or company valuation[10]. It is also frequently perceived as a tool with whom all nails could be hammered; dealing with issues from corruption in Africa to delivering babies (Awodipe, 2019).

[10] An example: a company that sells ice tea renamed to "Long Blockchain" which was enough to quadruple its stock price (Rapier, 2018).

One of the main promises of the blockchain technology is establishing trust: it suggests that trust – as a main building block of finance (and economy in general) – could be coded within software. Indeed, paradigms shifted with the advent of internet and other communication technologies: relationships between humans, institutions and systems now primarily take place in the virtual, online sphere. We produce, interact, buy and sell all sorts of things without ever seeing each other or shaking hands. When most of our activities transpire within this realm we find ourselves in need of a robust framework for our virtual relations: from proving identity and ownership to establishing lasting business partnerships. Blockchain promises a platform where trust can be "programmed" – obtained by software code which is undisputable, concise, consistent and stable – opposite to human relationships which are often completely opposite.

However, one would be wrong to believe that trust issues are completely resolved by blockchain. Trust (similar to risk in finance) cannot be removed or deferred, it can only be transferred[11]. While it seems easier to trust technology (which is complex but low-dimensional) than humans (which are inseparably both rational and emotional, and prone to exogenous influences – unlike software which does not react differently if the sun is shining[12]), behind every technology ultimately there is always a person. While no one can bribe an algorithm, and while software cannot change its opinion and suddenly slide with the competition, algorithms do not produce themselves ex nihilo: humans make them. Since most people are not experts in coding and cannot review nor audit the source code, ultimately we are dependant to those who provide the technology: we either trust or do not trust them. Furthermore, if the providers are anonymous even larger scope of trust needs to be laid out in order to establish a functioning system.

On the other hand, if nothing else, blockchain provided a new label for the increased yearning for more transparency and individual power in today's ever more interconnected, but simultaneously distant and alienated, big data world, where only a few American companies (Google, Microsoft, IBM, Facebook, Apple) govern and control almost entire digital domain. It expressed a desire for the democratization of information management (creation, storing, sharing, (re)selling, etc.) processes, and that is an impetus worth following.

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Keynote paper

THE ANALYSIS OF THE USE OF E-COMMERCE IN THE REPUBLIC OF CROATIA

Abstract

The Internet and Information and Communication Technologies have an important role in changing business and communication. Companies that want to succeed and be competitive on the market have to do business in the virtual world and go through the process of digital transformation. This fact is especially prominent in countries like Croatia, which in the last thirty years have undergone a transition from Socialism to Capitalism. IT specialists from Croatia are highly respected in the world, and many innovative solutions for electronic business operations are being developed in Croatia. Croatia's role model for application of e-business is Estonia, where the innovative use of IT has caused a significant GDP growth.

This paper analyses available official data on the use of the Internet for e-commerce in the Republic of Croatia. Also, for the purpose of this paper, a primary survey was conducted on a random sample of citizens of the Republic of Croatia. The survey was conducted using an online survey questionnaire distributed via social networks and electronic mail, examining the tendency of respondents to use ICT and their attitudes and ways of using e-commerce as a major part of electronic business operations. The purpose of the survey was to compare the obtained results with the official data on the use of e-commerce and ICT in the Republic of Croatia and to determine how much, when and for which needs the respondents used the Internet for shopping. The data obtained through the survey questionnaire were 21ttack21a using different statistical tools in order to extend the knowledge about the motives, ways and intensity of use of e-commerce in the Croatian society.

Keywords: *Internet, ICT, e-business, e-commerce.*

1. Introduction

Back in 1975, the e-business concept appeared in the business world, which implied a paperless business, i.e. the concept of paperless office. In the article published in the Business Week under the title of the „Office of the Future", the legendary leader of the Xerox Palo Alto Research Centre, George E. Pake, has predicted a technology that by 1995 should enable employees to simply press the button and send the necessary information to all the employees for whom it is intended, without the piling of printed documents in the offices (Business Week, 1975, as cited in van Meel, 2011). More than a quarter of a century later, this kind of business became commonplace, so today there is an increasing number of virtual offices in which business is not limited to classical office space, but most of the communication and business processes are done with the help of the Internet and various software. Companies that have quickly adopted the new technologies and applied them to day-to-day business are now ahead of competitors. By comparing business results, it is clear that in a very short period of time, companies that have invested in information systems and have changed the slow and monotonous manual office processes into more efficient and cost-effective forms of digital business, have taken dominant position.

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Electronic business is a contemporary model of organizing business, which implies the intensive use of IT and, in particular, of Internet technologies in all key and core business functions and processes (Panian, 2013: 13).

All companies that want to penetrate and succeed on the market must use electronic business as the latest model of organizing business. Simply put, e-business allows companies to make more money, while saving money and time by using ICT and especially the Internet. Companies connect business processes, create information, and track documents and data flow together with partners and suppliers, and combine everything into one business system. At the same time, the quality of business is increased and customers' wishes are fulfilled. Market competitiveness is enabled by the worldwide computer network - the Internet - by increasing the availability of information and purchasing opportunities, where both large and small businesses have equal market opportunities. Often, the term electronic business is identified with the term electronic commerce, because ultimately every business is reduced to trade. Andrew Bertels, Vice President and Research Manager at Giga Information Group Inc. defined the difference between these two terms in the following way: „Electronic commerce involves the exchange of goods and services between customers, business partners and sellers. The supplier is interacting with the manufacturer, the buyers with sellers, and the forwarders (shippers) with distributors. Electronic business includes all these elements, but also operations performed "behind the scenes" and within the company itself. Such operations are, for example, management of production, development, comprehensive corporate infrastructure and products." (Bertels, 2000)

There are the following types of e-business:

- Business to Customer (B2C)
- Business to Business (B2B)
- Customer to Customer (C2C)
- Business to Employee (B2E)
- E-Administration
- M-commerce i.e. mobile commerce. (Datalab, 2018)

All of these types of e-business are used in one or more business models, i.e. in the ways in which a company generates revenue on the market.

Companies that do not focus their business on e-business will be faced with extremely big problems in the future. Clients search for answers to most questions about products on the Internet, and business partners check the company's website before any contact. It used to be enough for a company's website to contain a phone number and address, but today it is necessary to include good explanations about the products and service, client and partner reference list, the possibility of interaction with potential and existing customers and partners.What was enough twenty years ago is completely outdated today and companies have to keep up to date in order to be able to do business successfully. Electronic business enables doing business 24 hours a day, 7 days a week and 365 days a year and can exceed the trades of the standard retail shops.

Companies need to go through the process of digital transformation, which involves more intelligent and more innovative business operations and can be achieved by involving the user, empowering employees, optimizing business and transforming services and products. Digital transformation is a continuous and extremely complex process involving not just the IT department, but the entire company, and at the present time can be considered a necessity. Statistics show that as many as nine out of the ten digital transformations fail. Igor Vukasović says that today "…the main story revolves around digital platform companies that did not exist twenty years ago, and three of them not even 10 years ago: Airbnb (the largest global provider of accommodation that has no real estate), Uber (the world's largest 'taxi' that does not own a car), Alibaba (the world's largest non-inventory retailer), Facebook (the world's largest media that doesn't generate any content on its own), Netflix (the world's largest TV provider that does not have any cables) or Instagram (the

largest photo sharing company that doesn't own a camera)" (Lider, 2018). The aforementioned examples demonstrate the digital revolution in business and its perspective in the coming years.

2. Electronic business in the world, Europe and the Republic of Croatia

In order to start an electronic business, it is necessary to make a decision about a new way of communicating with potential buyers and partners. E-business begins by creating a domain with a company name and a web site on that domain. Steps needed to start electronic business:

1. Analyze hardware and software needs.
2. Develop a technical and business strategy.
3. Create a basic database.
4. Online information for clients and partners about products and services.
5. Merge all data into business software.

At the global level, online sales are measured in trillions of dollars. The eBay company that specializes in online sales has annual revenue of approximately $ 9.7 billion, and in the European market, e-commerce revenue in 2017 amounted to $ 321.796 million. In Croatia, 14% of web retailers had revenue in excess of three million Kuna (14%) in 2017. (Datalab, 2018)

The entry into force of the Law on E-invoicing in Public Procurement in 2018 contributed to the continuation of business digitalization. Computers are replacing electric printer machines, and e-mail is replacing paper mail. Around twenty years ago, when Internet banking was introduced, this product was dominated by the ultimate consumer distrust and it was the banks' worst sold product, but today even the elderly population uses mobile banking services on their smart phones. The main reason for this is that services that are customized for personal computers and mobile phones are essentially simple and easy to access and save users time and money. In Croatia, the benefits of e-business were first recognized by large companies, through the exchange of information by means of information systems, while e-business is now used by small and medium companies whose business operations involve large amounts of data. Within this scope of business, each document is generated in digital format and is a part of the company's mandatory information system, so the need to store documents in paper form has disappeared. By introducing an electronic signature, the requirement of stamping, signing and then printing the document is cancelled. Document remains in its primary digital format and it saves time needed for printing, archiving and ultimately document searching.

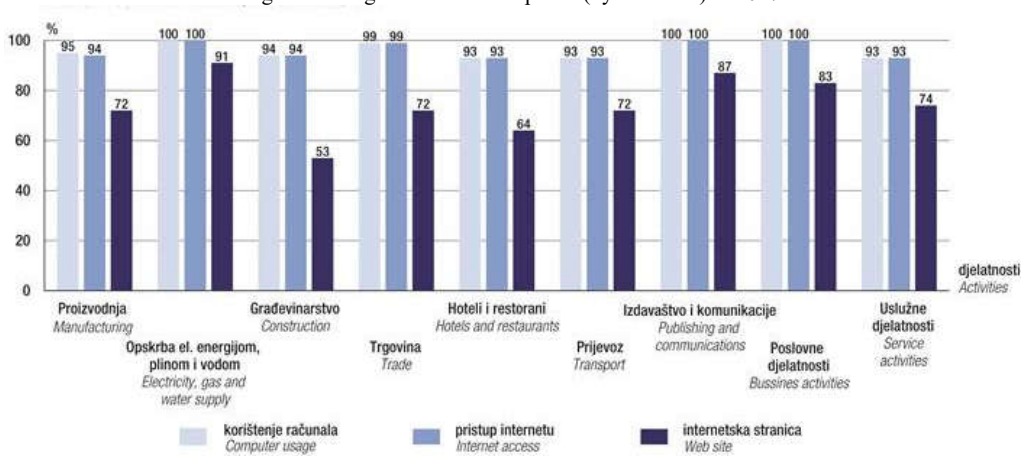
Business issues are most commonly caused by administrative disputes and poor communication between company departments, but problems such as this can be avoided using e-business services with efficient and easy-to-run business documents. The domestic IT sector meets the requirements set by the European Union and follows world trends through developing solutions in the form of a management of business documents or DMS (document management system). Solutions are accepted by most companies as they speed up business, reduce costs, enable document centralization, and access to documents via mobile phones regardless of their current location.

One of the countries that can serve as a role model for Croatia's e-business application is Estonia, which is the country that, according to the Britain's The Economist, has successfully achieved GDP growth by two percent on an annual basis through successful digitalization. An e-Residency system has also been developed, which enables opening a company in Estonia without a physical presence. Kaspar Korjus, head of Estonia's e-residency program, estimates that Estonia will attract up to ten million new e-residents by 2025, among which there could be many British entrepreneurs affected by the Brexit (ZDNet, 2017).

Croatia is also moving successfully in this direction and is the leading country in the region in application of e-business. One of the goals of the European Union is to encourage companies to abolish paper invoices and introduce e-invoices by 2020 in order to save 423 billion Euros annually. Business digitalization is supported by the Croatian Chamber of Economy. Creating an appropriate

market in Croatia would also help prevent the departure of IT experts from the country. Croatian IT specialists are highly respected in the world and business digitalization could be one of Croatia's main advantages over other countries in the region. In addition to e-invoice, domestic IT specialists are working on other e-services such as e-approval, e-warning, e-order, e-receipt and other bookkeeping documents and services such as Quick Pay, which enables instant billing from the bank for small companies. Croatia has invested HRK 13 million to digitize official documents, and the Institute for E-business has hosted hundreds of highly-visited workshops on the subject of e-invoice. The Ministry of Economy, Entrepreneurship and Crafts supports the use of e-invoice. Also, in Croatia, platform named MojRačun (eng. MyAccount) has been developed in order to enable accounting software producers to implement the exchange of e-invoices between their users. Currently, no other country in the region has developed such a platform, and Croatia (as well as Estonia) could, through such measures, achieve GDP growth. Through the application of electronic business, the Croatian economy is becoming competitive on the European market, which could consequently lead to a decline in the grey economy.

Figure 1. Usage of ICT in enterprises (by activities) in 2017



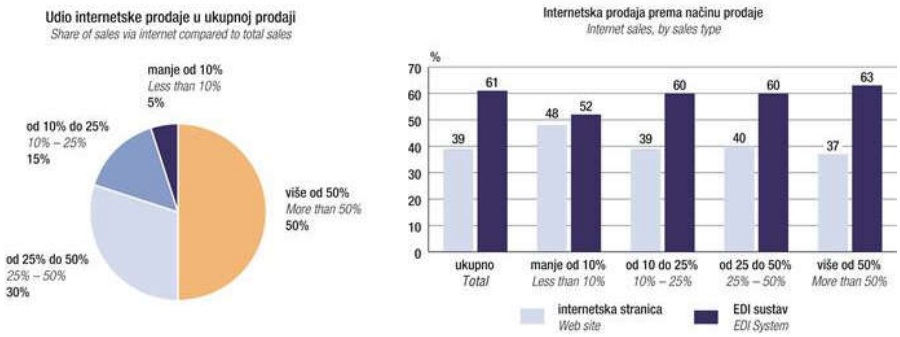
Source: https://www.dzs.hr/Hrv_Eng/publication/2017/02-03-01_01_2017.htm

In accordance with the data obtained by an extensive market research in 2017, the National Bureau of Statistics came to the following results:

- High level of ICT integration in business conducts; 96% of enterprises used computers, 96% of enterprises had internet access and 71% of enterprises owned a website.
- Usage of broadband internet access prevailed; 96% of enterprises used some type of fixed broadband internet connection and 83% of enterprises used mobile broadband internet access.
- Internet sales covered only 11% of the total sales of goods and services.
- Social internet media usage was not widespread and was used by 45% of enterprises.
- The appearance of the cloud computing internet service as a new technology; used by 31% of enterprises.(DZS, 2017)

Also, according to the above-mentioned market research, the volume of e-commerce in relation to conventional trade was still quite low in 2016, with only about 11% of sales being conducted through the Internet. Notably, 1/3 of those transactions was performed through web sites and 2/3 through automated Electronic Data Interchange (*EDI*) systems. (DZS, 2017)

Figure 2. E-commerce - Internet sales in enterprises in 2016



Source: https://www.dzs.hr/Hrv_Eng/publication/2017/02-03-01_01_2017.html

3. **Research methodology and analysis of research results**

The research was conducted at the beginning of the year 2019, using an online questionnaire distributed via social networks and e-mail. The questionnaire consisted of 15 parent questions with the closed-end sub-questions, in order to identify the profile of respondents and their attitudes towards using certain forms of e-business and their readiness to use ICT; as well as ways in which they use the Internet to search and purchase different categories of products and services. The survey was conducted on 115 respondents. Considering the method of questionnaire distribution, the sample obtained could be considered random but not necessarily representative of the area of the Republic of Croatia (since it did not cover respondents from all parts of the country). The results of the research were 25ttack25a using various statistical methods; some of the more significant results were processed and visualized using MS Excel and Tableau software packages.

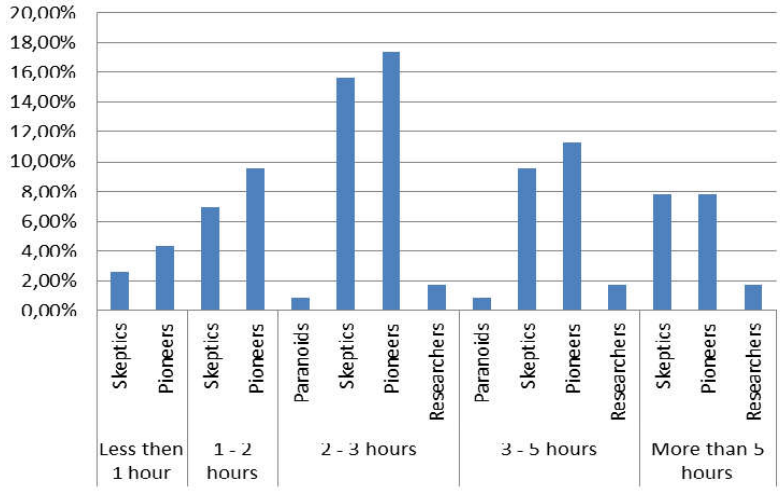
Respondents were mostly younger than 35 years of age (77.39%), with the majority of respondents aged between 26 to 35 (44.35%), while only 6.96% of them was older than 46. One of the possible reasons for this distribution of respondents with regard to their age is a slightly lower frequency of use of social networks (and the Internet in general) in older adults. Regarding the gender structure, female respondents are over-represented in the survey sample (68.7%). More than half (55.65%) of respondents were in some kind of marital (26.96%) or extramarital (28.7%) union, while the rest of the respondents were without partners (44.35%). Regarding the educational structure, majority of the respondents have a secondary education - total of 59.13% respondents, while almost one third (32.17%) have a secondary special education or higher education; and 8.7% of respondents have a master's degree or PhD. Most of the respondents (59.13%) were employed in the public or private sector, while the rest were unemployed, with most of them being students (34.78%) and housewives (4.35%). The employment status of the respondents reflected on the obtained results regarding their personal monthly income; 61.74% of respondents stated that their monthly income exceeds HRK (Croatian Kuna) 3000, with almost one quarter of respondents (23.48%) with income higher than the state average (which according to the data from *Croatian Bureau of Statistics* for the period in question amounted to HRK 6400[3]), while one fifth of respondents (20.87%) stated that they did not have monthly income.

The next parent question consisted of 10 sub-questions examining the attitudes and feelings (such as optimism, discomfort, and insecurity) of respondents regarding the use of modern technologies, which together form the so-called Technology Readiness Index [4] (TRI). With regard to the obtained

[3] Source: https://www.dzs.hr/Hrv_Eng/publication/2019/09-01-01_01_2019.htm (downloaded on 28.03.2019.)
[4]These questions comprise the Technology Readiness Index 2.0 which is copyrighted by A. Parasuraman and Rockbridge Associates, Inc., 2014. This scale may be duplicated only with written permission from the authors.

TRI, respondents are divided into one of five different categories (laggards, paranoids, sceptics, pioneers or researchers - respectively) starting from those who are the least willing to use modern technology and show general disapproval and scepticism towards the same, to the ones who are very eager to use modern technology when it appears on the market and have very positive feelings and attitudes towards using it (Parasuraman, 2000). In regard to the calculated TRI index, most of the respondents belonged to the category of pioneers (50.43%) and sceptics (42.61%), while the smallest part of the respondents belonged to the category of researchers (5.22%) and paranoids (1.78%). These results suggest that most respondents are highly inclined to use new technologies and have no significant fears and feelings of discomfort when using them. These results may be the consequence of the distribution channels used for the questionnaire (social networks and e-mail). In order to get a better and more representative picture of the attitudes of Croatian society to the use of modern technologies, the results of this online questionnaire should be supplemented by conducting the same research in a variety of ways other than on the Internet (e.g. by regular mail or personal telephone or site polling, etc). The following graph (Graph 1) shows the structure of the respondents with regard to the calculated TRI and the average time they spend on the Internet per day. From this illustration it is clear that most respondents (76.52%) spend more than 2 hours online on a daily basis, of which 40.38% spend more than 3 hours. What is particularly interesting, and can also be read from the included graph, is that among the respondents who have had lower TRI (paranoids and sceptics), most of them spend a lot of time on the Internet, some even over 5 hours (7.83%). The obtained results in some way point to the unavoidability of using the Internet in today's modern world, no matter how much it coincides with personal preferences and attitudes. The fact that nearly two-thirds of respondents (62.61%) reported that they use a smart phone to access the Internet every day, or over 90% of those who answered reported that they use the smart phone on a regular basis, frequently or on a daily basis, supports the above mentioned results.

Graph 1. Respondents with regard to TRI and the average time spent on the Internet per day



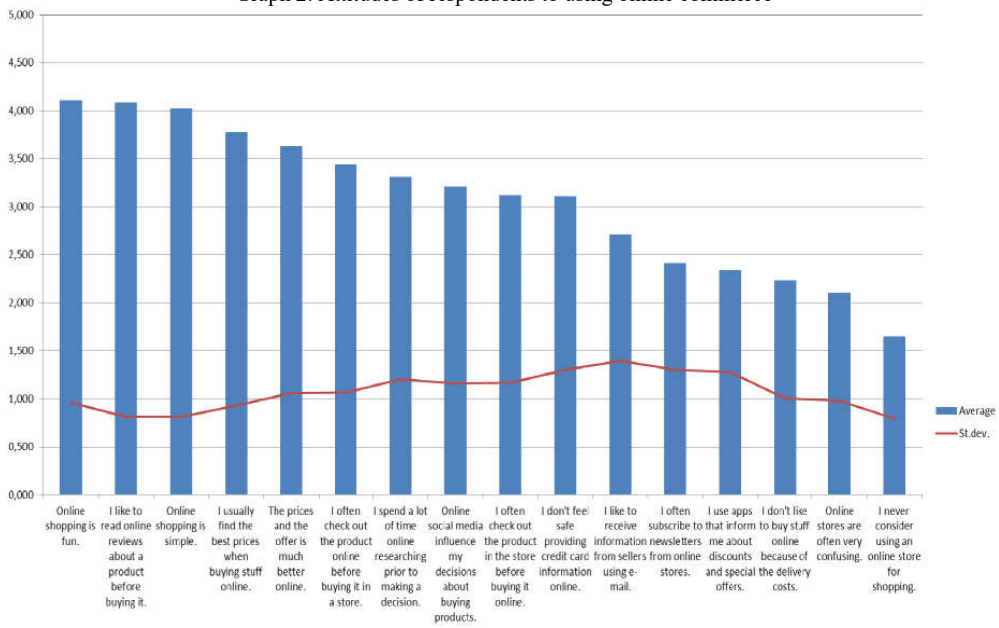
Source: Authors

The other devices that the respondents used for daily access to the Internet were a laptop (26.09%) and a desktop computer (20.87%). Tablet was the least used device (4.35%) alongside other devices (1.74%) with integrated internet browsing capabilities (such as smart or android television and the like). The next question was to examine the attitudes of respondents regarding various aspects of e-commerce use. The parent question consisted of 16 sub-questions in which respondents evaluated with the 5-degree Likert scales to what extent they agree with the e-commerce related claims (where grade 1 meant "totally disagree" and the grade 5 meant "completely agree").

From the results obtained (Graph 2), it is apparent that respondents to the greatest extent agreed with the statements that online shopping was fun (avg.=4.112, st.dev.=0.96), that they like to read

online product reviews before deciding to buy products (avg.=4.087, st.dev.=0.812) and that online shopping is simple (avg.=4.026, st.dev.=0.811), while they least agreed with the claims that online shops are very confusing (avg.=2.104, st.dev.=0.977) and are never considered as an option for shopping (avg.=1.652, st.dev.=0.795). In reference to other results, it is certainly worth mentioning the relatively high ratings on the possibility of finding favourable prices on the Internet (avg.=3.774, st.dev.=0.928), better prices and greater offer of online products and services (avg.=3.625, st.dev.=1.062), and using online store as a kind of "showroom" before purchasing products in real-life retail store (avg.=3.443, st.dev.=1.069). It is interesting, in the context of the phenomenon of so-called "influencers", to comment on a somewhat low average rating by which respondents have assessed the claim that social networks affect their purchasing decisions (avg.=3.209, st.dev.=1.158), despite the fact that it is difficult to objectively assess the impact of social networks on this type of decision, given that most of the messages that are distributed in this way are very carefully designed and "packed" in the form of interesting videos and social media releases. Also, based on the comparison of average values and standard deviations in the aforementioned graph (Graph 2), it is apparent that the respondents generally agreed more on the claims that were rated high, rather than those that were rated by lower average grades.

Graph 2. Attitudes of respondents to using online commerce



Source: Authors

In the following tables (Table 1 and Table 2), frequency of responses to questions related to the regularity of search and purchase of certain groups of products and services on the Internet, are displayed. Products and services were divided into 20 categories according to the most commonly used product and service categories presented on popular online services and stores such as eBay, Alibaba.com and the like. Respondents were able to choose one of the five offered responses (never, rarely, occasionally, frequently and daily - respectively) for each category, given their personal estimation of the frequency of Internet searches in the search for products and services of a particular category, i.e. the frequency of purchasing noted products and services through Internet. The results show that they the most common[5] searched categories are: "Clothing, Footwear and Fashion Accessories", "Sports Equipment", "Tourist Excursions", "Tourist Accommodations", "Plane or Bus Tickets", "Social Event Tickets", "Household Appliances", "Audio, photo and video

[5]More than 50% of respondents answered the question: occasionally, frequently or daily.

equipment", "Mobile phones and associated equipment", "Movies and series", "Music" and "Home furnishings and equipment". Answering the question regarding the frequency of online purchasing, respondents in almost all categories stated that the products and services were purchased much less on the Internet than they were searched for.

Table 1. Search and purchase frequencies of products and services over the Internet - Part 1

	Clothes, shoes & fashion accesories	Sports equipment	Personal care products	Children's toys & accesories	Pets & pet accesories and food	Tourist excursions	Tourist accommodation	Airplane or bus tickets	Tickets for social events	E-books
The frequency of online searches for products/services										
Never	8,70%	21,74%	42,61%	54,78%	68,70%	16,52%	10,43%	16,52%	18,26%	43,48%
Rarely	13,91%	22,61%	21,74%	18,26%	17,39%	22,61%	21,74%	14,78%	22,61%	25,22%
Occasionaly	28,70%	28,70%	21,74%	14,78%	8,70%	33,91%	33,91%	30,43%	27,83%	15,65%
Often	39,13%	20,00%	12,17%	8,70%	3,48%	20,87%	29,57%	33,04%	27,83%	10,43%
Daily	9,57%	6,96%	1,74%	3,48%	1,74%	6,09%	4,35%	5,22%	3,48%	5,22%
The frequency of online purchase of products/services										
Never	16,52%	40,00%	56,52%	64,35%	75,65%	32,17%	23,48%	24,35%	30,43%	63,48%
Rarely	23,48%	22,61%	15,65%	13,04%	14,78%	27,83%	21,74%	22,61%	22,61%	14,78%
Occasionaly	28,70%	24,35%	22,61%	13,04%	4,35%	27,83%	28,70%	23,48%	25,22%	9,57%
Often	27,83%	12,17%	5,22%	8,70%	4,35%	8,70%	22,61%	25,22%	17,39%	8,70%
Daily	3,48%	0,87%	0,00%	0,87%	0,87%	3,48%	3,48%	4,35%	4,35%	3,48%

Source: Authors

Surprisingly, the only exceptions in this respect were the categories "Food and Drink", "Cars, Motorcycles and Equipment's" and "Real Estate", where respondents estimated that they frequently purchase these products via the Internet in comparison to searching for informations about them. The results obtained may be due to the familiarity of products and services ("Food and Drink") on the one hand, which reduces the need for their search, and the high cost and inefficiencies of purchasing through the Internet ("Cars, Motorcycles and Equipment's" and "Real Estate") on the other hand.

Table 2. Search and purchase frequencies of products and services over the Internet - Part 2

	Food & beverages	Household appliances	Audio, photo & video equipment	Computer hardware & software	Mobile phones & phone accesories	Movies & shows	Music	Cars, motorcycles & equipment	Furniture & home decoration	Real estate
The frequency of online searches for products/services										
Never	70,43%	34,78%	25,22%	40,00%	20,87%	27,83%	22,61%	43,48%	25,22%	53,91%
Rarely	16,52%	13,91%	12,17%	20,00%	20,00%	11,30%	7,83%	18,26%	22,61%	26,09%
Occasionaly	6,09%	27,83%	34,78%	20,00%	33,91%	10,43%	13,91%	17,39%	28,70%	13,04%
Often	4,35%	19,13%	22,61%	13,91%	19,13%	29,57%	31,30%	13,91%	15,65%	6,09%
Daily	2,61%	4,35%	5,22%	6,09%	6,09%	20,87%	24,35%	6,96%	7,83%	0,87%
The frequency of online purchase of products/services										
Never	16,52%	40,00%	56,52%	64,35%	75,65%	32,17%	23,48%	24,35%	30,43%	63,48%
Rarely	23,48%	22,61%	15,65%	13,04%	14,78%	27,83%	21,74%	22,61%	22,61%	14,78%
Occasionaly	28,70%	24,35%	22,61%	13,04%	4,35%	27,83%	28,70%	23,48%	25,22%	9,57%
Often	27,83%	12,17%	5,22%	8,70%	4,35%	8,70%	22,61%	25,22%	17,39%	8,70%
Daily	3,48%	0,87%	0,00%	0,87%	0,87%	3,48%	3,48%	4,35%	4,35%	3,48%

Source: Authors

In addition, it is worth to mention the categories in which considerable (more than 30%) differences between the frequency of search and the frequency of Internet purchase were noted, such as "Audio, photo and video equipment" and "Mobile phones and accessories ". This significant difference in percentages indicates that there are categories for which potential buyers are happy to use the Internet for product information, but seldom decide to buy those items online.

Finally, when asked about the use of Internet banking services, more than one fifth of respondents (21.74%) answered negatively, while almost half (43.48%) responded that they use Internet banking at least once a week (35.65%) or even daily (7.83 %). Respondents who use Internet banking showed their satisfaction with the use of Internet banking services by grading it with a high average rating of 4.302 (st.dev.=0.919).

4. Conclusion

Undoubtedly, the Internet has affected the way the whole world does business. Many different e-business models arise on a daily basis, making living easier and more comfortable by providing services accessible 24 hours a day from any location and for anyone who needs them. In spite of many pessimistic forecasts about people losing jobs to computer aided industry, the real truth is probably closer to the point that ICT's will create many new jobs and opportunities for businesses to be more innovative and to generate new products and services. The main objective of this paper was to examine the extent of e-commerce use in Croatia. Given the results of the research conducted for the purpose of writing this paper, it can be concluded that a high percentage of Croatian citizens access the Internet on a day-to day basis, using predominantly smart phones and PC's, spending over 2 hours online in average. Almost all of the examinees included in this research used Internet to search for information about products and services and to make online purchase. The results of the Technology Readiness Index indicate that most of the examinees are still very sceptic when it comes to using new technologies, although practically all of them use it regularly to make online transactions. Considering the vast investments made by the governments and companies around the world to digitalize services and businesses, it is reasonable to expect that the use of technology is going to become inevitable for every citizen of the globe.

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Review paper / Pregledni rad

APPLICATION OF BLOCKCHAIN TECHNOLOGY

Abstract
There are several reasons why blockchain has great potential and importance in today's world of technology and information distribution. Although this is a relatively new technology, blockchain's currently experiencing great interest to the public and society, not so much that is ubiquitous today, but because of the wide range of possible uses. This work introduces the theoretical framework of this technology and the reasons for its creation, possibilities of blockchain application and the way it could change forever the current shapes of financial, economic, and most of all, the world of business. The aim of this work is to highlight the importance of the development of this technology and to encourage further interest-minded who believe that the current forms of business have room for improvement and progress. Thinking in this direction, it is necessary to identify different areas of application that currently use blockchain, such as cryptocurrency, smart contracts, digital signatures, decentralized data management and many others. It also seeks to explain how the use of this technology can improve efficiency and create faith in, not only financially and economically, but also in many other systems, because blockchain technology has great potential to become a new form of business. The only question is, in which industrial sector most likely success blockchain and depending on the branch, how much is actually, business economic world ready for large-scale migration and changes.

Keywords: *blockchain, cryptocurrency, smart contracts, decentralized data management*

1. Introduction

Blockchain is a decentralized system of data management. It is a large database that is distributed on different servers, which is a great advantage when it comes to data security within that database. What is common to all blockchain users is equality of shared data, in other words, each user has the same data as another user / users in their communications. This is the reason of a big widespread of the application of blockchain technology. The original application of blockchain was developed in the financial field due to the need for the first cryptocurrencies. It was introduced in 2008 as Bitcoin. The technology continues to evolve further in the direction of smart contracts which are explained as cryptographic contracts for the execution or verification that does not need the help of a third party or a person. Therefore, Ethereum develops as specially designed decentralized platform of smart contract and works as a decentralized computer. Spontaneously, blockchain's developing for the needs of various insurance, intellectual property protection, group financing, decentralized management services, data storage, and more. A full development of the technology and its implementation are still waiting today.

2. Blockchain structure

The term of blockchain can be easily translated as a chain of blocks. It is the data blocks that are connected in one-way chain, in which each new link, or block, depends on the value of the first older link. As it usually happens in information technology when necessary safety is required for a certain level of privacy, connecting blocks in the chain is based on cryptography (Arunović, 2018). Blockchain system is made up of blocks; each block represents a set of data. In the table

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(Table 1) shows that one block consists of a header in which are recorded metadata of the digital information list with variable length (Hozjan, 2017).

Table 1. Block structure of blockchain

Size	Name	Description
4 bytes	Block size	Block size in bytes
80 bytes	Block header	Block metadata
1-9 bytes	Record counter	Records contained in the block
Variable	Record	Records stored in the block

If we imagine blockchain as one big book, blocks represent pages of this book, which besides of its content, contains informations on the previous and following pages. If pages losses or get wrenched, in the book remains pages with informations of lost page. It is a system whose users communicate with their neighbors, and these same neighbors communicate with their neighbors. It is imagined as a decentralized data management system, and his every user has the same information as the other user/users within their communications. The system of equal partners, or system constructed by equal partners model (peer to peer) consists of a large number of identical processes, so-called partners (peers). Partners carry out tasks according to the needs of its users. If a partner needed help in performing some tasks, he shall enter into communication with his neighbors, and his neighbors with their neighbors, and so it is communication on a system-wide. Such systems can be divided according to the structure as centralized and decentralized systems. Centralized systems are those systems in which there's a central party or server. The role of the server is to connect clients so they can continue to communicate with each other. The main characteristic of the decentralized system is that there is no outstanding server. Architecture of centralized and decentralized systems is shown in the pictures (Figure 1 and Figure 2).

Figure 1. Architecture of centralized system

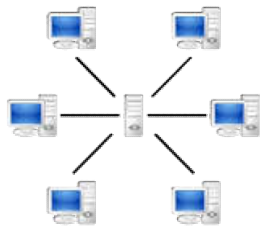
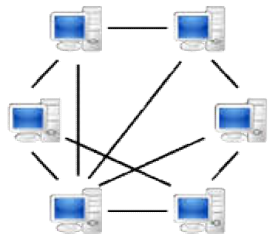


Figure 2. Architecture of decentralized system



In that way, the need for a third party in the communication that takes place in almost real time is being avoided. It is a large database that is distributed on different servers. It differs from the common database by containing a lot of software to help validate the data within blocks and allows you to communicate with other servers. What is common to all blockchain users is equality of shared data, in other words, each blockchain user has the same data as another user/users in their communications. For almost every form of communication, you need some kind of protection and security, so data traveled in communication channels can be correct, accurate and safely supplied to the other end of the communication. Therefore, blockchain is secured cryptographically, for the purpose of identification and protection of participants, but also the information within that system. If cryptography did not exist, intruders or adversaries could listen in and even control the communication channel. With cryptography one user can send informations to another user without having someone unknown taking part in sending information. Cryptography is not just used to prevent intruders and adversaries from taking part of the information sent it is also used to ensure that the information is not modified and that the information is sent from the right user (Corluka, Lindh, 2017).

Two network consensus or algorithms help communicate with users who don't know each other and don't trust each other. These algorithms are proof-of-work and proof-of-stake algorithms. The concept of consensus is interpreted as agreement on the value of one variable. One way of the agreement is that each user in the communication gets one vote by which can vote for approval eg. A single transaction. Numbers of votes of the majority decide which transactions should be carried out and thus the algorithm proof-of-work is created.

However, this concept can be disrupted by co called Sybil attacks. One user takes more accounts and in that way can affect the majority of votes. Therefore, the second algorithm proof-of-stake is created, which is based on the concept that instead of voting, the user who has the most money (stake) can support the confirmation of the transaction. The main idea is that one user who has the highest share or money, only does what is in the interest of that share. The problem that arises with this consensus is distortion of decentralization, which substantially impairs the whole concept of blockchain. Each user in the communication can eather and/or read and/or write inside blockchain. One of the most important characteristics of this system is the immutability onced entered data and quickly and easily detection of changes to the same data. Blockchain technology can be public and private. Public blockchain is based on the idea that everyone can write and read data in blocks or only validated people can write and everybody else can just read data. Private blockchain involves writing and reading only validated by the users, which is quite useful in large organizations and companies.

3. Application of blockchain (financial sector)

Although blockchain is not conceived just as a virtual currency or as a form of digital transactions, most of it speaks today exactly as such. If you try to talk about blockchain in society, perhaps interlocutors will not be overly intrigued nor informed. But when Bitcoin is mentioned, one of the most popular crypocurriences, the conversation takes on the dynamics and there is no person who hasn't already heard or doesn't have an opinion about digital currencies. Why blockchain is experiencing the greatest success in the financial form and why the society and public that part of blockhain's most interesting? Zemunik (2016) lists several possible reasons: ideological reasons - because of the belief that there may be a currency and the whole system linked to it, not under control of the central bank. The assumption is that blockchain is appeared in the times of big crisis in the world, in the moments when man loses faith in the classic financial trading systems, in banks as impartial third party, the stability of the currency, etc. Furthermore, some of the other reasons are: a way of storing value, small transaction costs, no third intermediaries who may abuse the informations and data or manipulate the value of the currency, the slowness of the system, the fact that in spite of Internet banking are still needed paper certificates, and many others. Blockchain has

the answers to these problems, so it is considered to be greatly shaken the financial sector through the golden eight by Tapscott & Tapscott (Mihaljevic, 2018):

- Authenticate & Attest to Value - today we rely on powerful intermediaries to conduct identification and establish trust between transaction parties. Blockchain reduce, or in some cases eliminate the factor of trust because the same is placed in the blockchain network. Establishment of identity in this manner represents a robust, verifiable, and cryptographically secured manner of cooperation between the entities involved.
- Transfer value - blockchain technology can do for the financial sector what is container transport done for the transport sector, to reduce cost, increase speed, decrease the resistance during transfer and thus increase economic growth and prosperity.
- Store value - payment mechanism combined with a reliable and safe storage of value reduces the need to use conventional financial institutions, bank deposits and savings accounts will become unnecessary
- Lend value – The blockchains each individual will be able to issue, trade and solve classical financial instruments directly, without the intermediation of financial institutions and will also reduce costs, dramatically increase the speed and increase transparency. Participants will be able to get loans from other participants in the network. This is a very important factor for those who currently have no access to conventional financial institutions.
- Exchange value - the time required to credite transactions in the financial market, when trading securities and other derivatives that are traded on financial markets, is measured in days, sometimes in weeks. All this creates problems in the financial market participants. Blockchain technology will reduce the processing time of the transaction by weeks and days to minutes and seconds.
- Fund & Invest - today for any large capacity investment is necessary to participation by third parties or financial institutions. Although already financial institutions perform the function of connecting investors and entrepreneurs seeking funding for further development, using blockchain technology will increase the pool of participants in such markets. Each individual will be able to easily, quickly and safely invest their money in an entrepreneurial venture. Furthermore, payment of the shares and the coupon will be more transparent and more secure.
- Insure Value & Manage Risk - blockchain supports decentralized models of insurance, and thus the use of derivatives for risk management becomes more transparent. Using reputational systems that analyze the social and economic capital of the individual, their feats and other attributes, the insurance company may have a clearer picture of their clients and the risks they are taking.
- Account for & Audit Value - the traditional accounting will not withstand the challenges of modern business. Blockchain technology, using its distributed book transaction will enable audit and financial reporting in real time. Also the whole business of all participants in the market will become more transparent.

In 2008, pseudonym Satoshi Nakamoto published the so-called White Paper describing the concept of digital assets and payment systems, and he laid the foundations of the first decentralized digital currency today known as Bitcoin.Bitcoin is:

- private - no issued by any institution,
- decentralized - there is no central publisher, units of currency are awarded decentralize through an algorithm,
- digital - fully electronic currency, without the necessary physical manifestation nor binding for certain goods,
- crypocurrency - cryptography is used for verification of transactions and control the generation of new currency units (Matanović, 2017).

Due to its open source code many other crypocurrencies are generated, more or less different in relation to Bitcoin. Unlike previous systems for digital money and payment, with Bitcoin there's practically no money. There is a blockchain which acts as a publicly accessible main accounting book, which has written all transactions ever realized. How much money user holds, and whether some of that money can pass on, practically comes from the calculation of all previous transactions, which are publicly available. If we try to spend money that we do not have, the miners will not validate our transaction and it will be rejected. User anonymity is ensured in that the part so-called transactions wallets, which represent the pair of public and private keys. Just owning a private key for the wallet allows further manipulation with assets. Here lies the biggest risk to end users - if for any reason we lose the private key of our wallet, or get stolen from us, there is no more opportunity to take back control of our resources (Minović, 2017). With the appearance of new modes of electronic commerce, there are also other possibilities related to a variety of group financing. The blockchain allows storage of informations and data in one large registry (the database), allows raising funds with various checks, can protect the identity of participants of group financing, but also can be fully transparent. Application of this technology would eliminate the falsification identity of participants and manipulation of election results (or, the results of project selection). Also, there is possibility of using virtual money, which participants can support projects on the platform in a transparent way and gain insight into all transactions and details of the projects financing (Vlahovic, 2017).

4. Application of blockchain (non-financial sector)

One of the most important blockchain application, right after the financial one is in form of smart contacts. Smart contract run on the blockchain and thus have the same characteristics, such as transparency and cryptography. A smart contract can be considered as a contract that is programmed in a computer code. Two or more parties digitally agree upon certain rights, obligations

and possible outcomes. The contract is "recorded in the blockchain and executed by distributed nodes of the network, which eliminates the need for a trusted third party". The contract will execute itself and will behave exactly as coded. This enables a broad variety of uses: an automatic payment based on a bet, paying and unlocking doors for an Airbnb, releasing financial aid after a certain period of escrow, issuing insurance payments after requirements are automatically checked, sending payments if someone succeeds in an online learning course and many more (Corten, 2018). Smart contract is a computer application that can automatically execute commercial transactions and agreements. One of the most popular platforms for executing smart contacts is Ethereum. It is a blockchain platform allowing anyone to build and use decentralized applications that run on blockchain technology. It is attempting to build technology on which all transaction-based state machine concepts may be built (Kikitamara, 2017). All transactions in blockchain technologies are essentially smart contracts—it is only the complexity which varies (Wall, Malm, 2016).

The most common use of blockchain in governance services is in the form of a notary public. Applying blockchain to notarization secures the privacy of the document, as well as those who seek certification. Publishing proof of publication using the cryptographic hashes of files in the blockchain takes notary timestamping to a new level. Even the Estonian government, in partnership with the world's first blockchain powered virtual country, Bitnation, will start offering a public notary service to their e-residents. Another form of governance service that also adopted blockchain is the online voting system or e-voting. Blockchain-enabled e-voting (BEV) empowers voters to do these tasks themselves, by allowing them to hold a copy of the voting record. The historic record could then not be changed because other voters could see that the record differs from theirs. Illegitimate votes could not be added, because other voters would be able to scrutinize whether votes were compatible with the rules, perhaps because they had already been counted, or were not

associated with a valid voter record. In this way, blockchain technology could encourage transparency in governmental systems (Kikitamara, 2017).

The Internet is full of informations that are also free content. To protect such content and to protect authors and owners of the content can be applied blockchain. Actually, they are losing the most, on an intellectual, financial and legal level. Assets, intellectual property, or any copyrights may be granted by the blockchain, ie participants within a blockchain. Once approved in blockchain-in, cannot be changed, so it is difficult to replicate or destroy. Everledger companies use this technology to record the diamond certificates in a permanent book. In this way, every diamond is uniquely described as well as its characteristics, purity, shape, weight, color, etc. Mycelia uses the blockchain to create a peer-to-peer music distribution system. Founded by the UK singer-songwriter Imogen Heap, Mycelia enables musicians to sell songs directly to audiences, as well as license samples to producers and divvy up royalties to songwriters and musicians — all of these functions being automated by smart contracts. The capacity of blockchains to issue payments in fractional cryptocurrency amounts (micropayments) suggests this use case for the blockchain has a strong chance of success (Blockgeeks, 2018).

Today we are witnessing the growing impact of automation and network control certain types of electronic devices around us. To reduce and monitor costs, increase efficiency and speed up the device to interact in our daily lives, it is necessary to harmonize the network software, sensors and electronic gadgets. Various household appliances, mobile phones, devices in cars, broadcast data which is then stored on Internet. Internet of Things platform then analyzes the data in order to extract valuable information and shared them with other devices in order to initiate certain commands or actions. The result is a better human experience, greater automation and improved efficiency.

This concept has been implemented in the health and music industries. For health-related applications, blockchain provides a structure for storing health data or electronic medical records (EMRs) on the blockchain such that they can be analyzed but remain private, with an embedded economic layer to compensate for data contribution and use. On the other hand, in the music industry blockchain was applied to maintain a comprehensive and accurate distributed database of music ownership rights information in a public ledger (Kikitamara, 2017).

Another non-financial sector, which would benefit by introducing blockchain is the energy sector. The individual blockchain platforms allow individuals to the energy produced by solar or wind power plants, which are located in their yards to sell its neighbors. In this way, energy distribution would be optimized, would become more accessible, and all involved users would have an incentive to turn to renewable energy sources, whose surpluses can offer to the market (Mihaljevic, 2018).

5. Conclusion

Blockchain technology is, although relatively new topic in IT, experiencing a big rise in the financial and economic world. It is interesting from a technical point of view, but even more so in business terms. The idea of business, conduct various transactions, endorsement and possession of virtual money without the need for third party, actually contribute greatly to the popularity of the blockchain concept. It is conceived as a large decentralized data book, distributed to nodes in which all partners are equal and secured by cryptographic algorithms. Saves time, and therefore money, guarantee greater protection of data, and transparency as well. However, there are still some challenges to this technology, such as the question of privacy, scalability, energy consumption and so on. Despite the challenges, there's no doubt in its further development and growth trends. Blockchain is directly linked to the future of modern e-commerce. It could revolutionize and do various for voting to be transparent, faster and safer. Insurance and protection of property, ownership and intellectual property rights in combination with blockchain could automate the whole process. Various areas in the public sector, such as land registry finally could process of

digitizing data to a whole new level of security, accuracy and transparency of data. It is possible its implementation for medical purposes for storing medical records which various hospitals, laboratories, physicians, and the patients themselves can access at any time, if required. Prediction of various analysts says that by 2030, the business world could reach earnings of two trillion dollars. Does this technology brings completely good or bad things, we cannot say for sure, but one thing is certain, blockchain will do many important things in the form of business, and we can just be witnesses of it.

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Preliminary communication / Prethodno saopštenje

THE ROLE OF ONLINE ADVERTISING IN THE PROMOTION OF HIGHER EDUCATION INSTITUTIONS IN TUZLA CANTON

Abstract

The development of the Internet has advanced the possibilities of online advertising through the World Wide Web, e-mail and social networks. For higher education institutions it is well-known that in developed economies they were aside for a number of years when it comes to the application of modern marketing, and for a long time they did not perceive, nor did they notice marketing as a business philosophy. Therefore, the subject of this research paper is online advertising of higher education institutions in Tuzla Canton area. The aim of the paper was to identify the role of online advertising in the promotion of higher education institutions in Tuzla Canton, which conduct similar study programs as the International Business Information Academy Tuzla, and also students' attitudes toward online advertising in the above mentioned higher education institutions. The methodology of this paper includes methods of analysis and synthesis in order to present the previous theoretical and empirical knowledge established in the field of online advertising of higher education institutions. It was found that online advertising contributes to better promotion of higher education institutions rather than advertising on traditional media,. The results of the research represent a suitable framework for the planning and implementation of marketing activities of higher education institutions in Tuzla Canton, with a special focus on online advertising.

Keywords: *higher education institutions, online advertising, social networks, Tuzla Canton area.*

1. Introduction

With the development of the Internet as a global network, there have been changes in the business of public and private institutions. In Tuzla Canton we have numerous private institutions opened, and there is an evident increase of the number of study programs and continuous introduction of innovative programs. Taking into account the law of supply and demand, it is necessary for higher education institutions to be oriented towards the market if they want to secure their existence. The aim of this paper is to analyze the role of online advertising in the promotion of higher education institutions in the area of Tuzla Canton. Taking into account the rapid advancement of modern information technology and the use of ICT in business, online advertising in higher education institutions is very important subject which aims to highlight the benefits of their application, then to create competitive advantage and also to position institutions in the consciousness of targeted users.

This paper is structured in four parts. Starting with the specificity of the promotion and the promotional mix, its key tools have been identified. Then, an analysis of the importance of advertising and internet advertising was performed. In the next part, there are described online advertising techniques like online advertising on the faculty web site, advertising through banners,

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links and passages, sponsorships, forums, top awards competitions. At the last part, there are the results about the role of online advertising in promotion of higher education institutions in the area of Tuzla Canton.

2. Promotion and promotional mix

Promotion is a set of procedures and methods for launching business messages to a particular auditorium with appropriate goals. The content and form of promotion depend on the auditorium according to which the promotion is directed. The mode of communication with the auditorium depends on: the nature, the size of the market for which the promotion is intended, the activities of the company and the characteristics of the products and services that are subject of entrepreneurial business (Klincov, 2010). The mission of all marketing implies that all marketing activities are designed to communicate something to someone, somewhere. Each company manages a complex and unique marketing communication system. Good marketing managers do not attach much importance to communication alone. They continue to communicate with the strategic, plundering information that will encourage the purchase of their product. They are aware that, if they have a better, more specific and creative offer, there is a greater likelihood that buyers who areinformed in that way will rather buy their products or services. Therefore, through a unique and strategic approach to marketing management, managers try to strengthen the current attitudes that can lead to a beneficial consumer behavior or a real change in attitudes of the target users of the company. Well-managed communication is extremely important for building and maintaining long-term relationships with customers, which is a key factor in building confidence.

Five main promotion mix tools (Kotler, Vong, Saunders, Armstrong, 2006):

1. Advertising - any paid form of communication intended to inform and affect one or more persons;
2. Personal sales - personal presentation by the sales staff of the company for the purpose of selling and building relationships with customers;
3. Sales promotion - short-term incentives that encourage the purchase or sale of a product or service;
4. Public Relations - serve to evaluate public attitudes and implement a communication program in order to gain public understanding;
5. Direct marketing - direct linking with carefully targeted individual consumers to provide the current response and nurture long-term relationships with customers. It is based on direct communication, one - to - one.

2.1. Advertising

Advertising is a complex system of communication and transmission of a paid message that is sent from a known sender to the unknown recipients via the media, in order to attract their attention, awaken interest and encourage action. As such, it falls under the type of engagement activity that must meet the numerous criteria of the advertising code (Klincov 2010).

Many research projects show that advertising is a factor that significantly influences the creation and shaping of public opinion in the sphere of consumption. Therefore, advertising is perceived as a form of mass communication, which in some way connects the production and consumption. Advertising goals can be classified according to their basic purpose, that is, the answer to the question whether they want to inform, convince or recall, and they are presented in Table 1 (Kotler, Vong, Saunders, Armstrong, 2006).

Table 1. Advertising goals

Information advertising	Persuasive advertising	Reminding advertising
- Informing the market about the new product - Suggest the use of a new product - Informing the market about price changes - Explain how the product works - Describing the services available - Correcting wrong impressions - Reduce customer fears - Building a company image	- Constructing brand preferences - Encouraging the transition to the brand - Changing customer perception of product characteristics - Convince the buyer to buy it right away - Confirmation of the buyer to respond to the call for sale	- Reminding the customer that a product might be needed in the near future - Remind the customer to buy the product - Reminding the customer of a product out of season - Maintaining top product awareness

Source: Kotler, Vong, Saunders, Armstrong, (2006)

2.2. Advertising on the Internet

With the development of the Internet, the opportunities for advertising on it have also been advanced. In addition to traditionally used banners, today we also encounter other types of advertising on the Internet, such as pop - up and pop - under messages or animated propaganda messages that appear when loading a page. Pop - up and pop - under messages include ad messages that appear in a special window when loading the requested web page. Pop-ups are those windows that appear over the desired page, and pop-under are those that appear below. (Ognjanov, 2003).

On the Internet, it is possible to advertise through various services, besides the Word Wide Web, there are also e-mail and social networks. Many companies send e-mails (ads, coupons, notifications) to the addresses of their existing customers at the base, but also to those potential ones to inform them about the new offer, various events, all with the goal of maintaining communication. What is especially popular nowadays, and it brings tremendous results, is advertising on social networks, primarily Facebook and Instagram advertising. The paid form of promotion on social networks involves sponsored texts / posts or images that are, to a certain extent, at a particular geographical location, displayed over time to a targeted public with the aim of calling for action. The great advantage of advertising on social networks is in specially enabled tracking tools and a detailed analysis of the ad reach.

3. Online advertising of higher education institutions

With the emergence of the Internet, the whole marketing philosophy of all institutions is changing significantly, so it is unimaginable that a higher education institution does not have a quality web site, which serves it for communication with users. It is also important to advertise on the website of the higher education institution, because it increases its functionality. It is necessary to mention other online advertising techniques in order to better and more economically promote institutions on the Internet. These techniques are: banners, links and passes (a user can link to another part of the same page or with a different page), as well as sponsorship (posting ads per page), forums, top award competitions, and sign-up to online ads. It is a great opportunity to use the Internet for educational purposes, and many educational institutions use it in different ways. Especially important are the activities in which Internet technologies are adapted to academic needs. Thus, students can get easier education, blogs, different online learning platforms, online bookstores, scientific papers, and more (Jevtić, 2015). While penetration of social media is extremely high among future students, the impact of these in the choice of study and institution is relatively low compared to more traditional forms of university marketing (Constantinides, Stagno, 2011). Higher education institutions have to embrace fully digital and social media marketing in realizing their target market and staying connected with them (Paladan, 2018).The research results carried out in Malaysia showed that social media and web sites have a positive influence on the decision-making process of students, which then significantly influences the choice of students to a particular university (Jan, Ammari, 2016). In Bosnia and Herzegovina, the use of online advertising at higher

education institutions is at an early stage of development. By the introduction of private higher education institutions, the use of marketing by educational institutions has increased considerably. The emergence of competition led to developing and creating marketing strategies that help to strategically and logically approachthe business and promotion of the educational institution.

Online advertising is currently more prevalent in private higher education institutions, which allows students to analyze in detail the institution when it comes to choosing further education. However, there are educational institutions that constantly monitor the development of marketing trends in Bosnia and Herzegovina and make additional efforts to improve their own work.

4. Research methodology

The aim of the research is to analyze the role of online advertising in the promotion of higher education institutions in Tuzla Canton. The survey questionnaire is the instrument by which data from the respondents were collected. Data were collected from first year students, from higher education institutions that conduct study programs related to study programs conducted at the International business - information Academy Tuzla (Information Technology, Contemporary Business and IT Management, Market Communications).

The questionnaire has collected data on student attitudes about the role of online advertising in the promotion of higher education institutions in Tuzla Canton. The questionnaire consisted of 10 questions. Primary research was carried out using the method of analysis and synthesis and hypothetically deductive methods. Secondary research was conducted on the basis of books, magazines and web sources that deal with the promotion of higher education institutions.

The subject of research is the promotion of higher education institutions in Tuzla Canton. Based on the publicly accessible list of higher education institutions in Tuzla Canton, this is a list of institutions for which primary research was conducted:

- Faculty of Economics, University of Tuzla
- Faculty of Philosophy, University of Tuzla
- Faculty of Electrical Engineering, University of Tuzla
- American University of BiH (AU BiH)
- European University Kallos Tuzla (EU Kallos Tuzla)
- International business - information Academy Tuzla (IPI Academy)
- Center for Multidisciplinary Studies Tuzla (CMS Tuzla)
- School of Finance and Accounting FINra Tuzla (FINra Tuzla)

H1: *Online advertising of a higher education institution in the Tuzla Canton area provides future students with the information needed to select a higher education institution.*

H2: *The official web site and user profiles on the social networks of higher education institutions in the Tuzla Canton area are important in promoting and informing the public.*

The research was conducted at eight higher education institutions in Tuzla Canton, which are conducting study programs related to the study programs at the International business - information Academy Tuzla. The sample consisted of 58 first year students and it was suitable. The research was conducted in the period from 23.05.2018. - 01.06.2018.with the respondents giving answers to questions related to their use of social networks as a form of communication and gathering information on higher education institutions and their attitudes towards advertising higher education institutions. The questionnaire is divided into three parts:
- Use of social networks

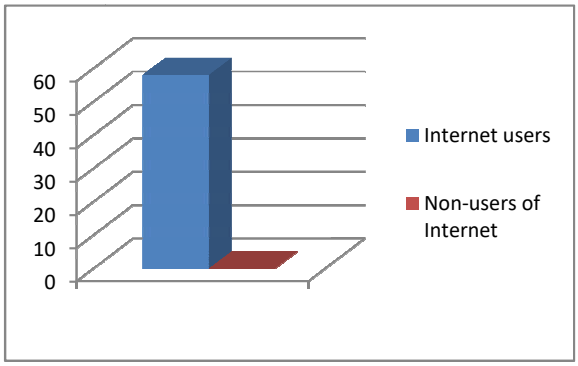
- Attitudes of respondents to online advertising of higher education institutions in the Tuzla Canton area
- Socio - demographic characteristics of the respondents

5. Results of empirical research

5.1. Use of social networks

Within the first part of the survey questionnaire, respondents were examined about the degree of use of the Internet, social networks, and the purpose of visiting those services. All respondents answered that they were Internet users, and none of the students replied that they did not use the Internet, as shown in Chart 1.

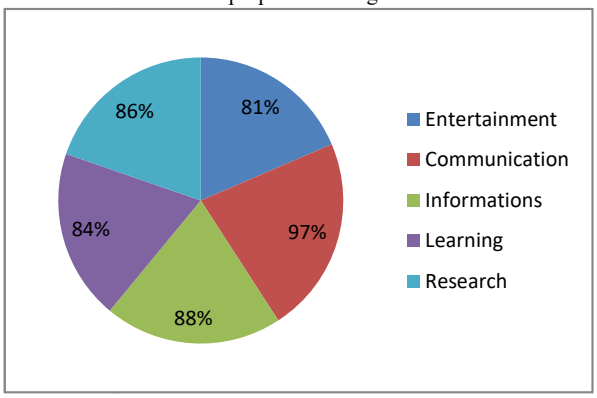
Chart 1. Use of Internet



Source: Authors

The purpose of using the Internet is shown in Chart 2., and it can be seen that the largest percentage of respondents, up to 97%, use the internet for communication purposes, 88% use internet for information purposes, 86% use internet for research, 84% use internet for the purpose of learning, and at the very end, 81%, respondents use the internet for entertainment.

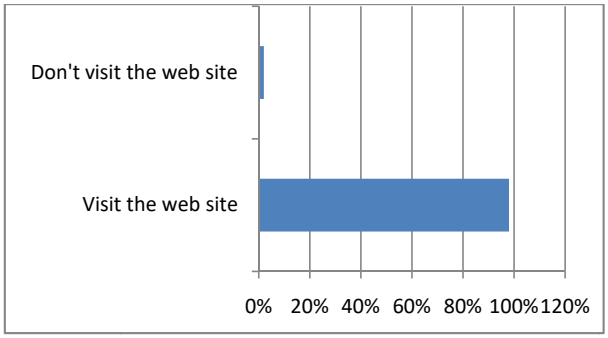
Chart 2. The purpose of using the Internet



Source: Authors

Chart 3.Shows that a total of 98% of respondents are visiting a higher education institution website, while only 2% do not.

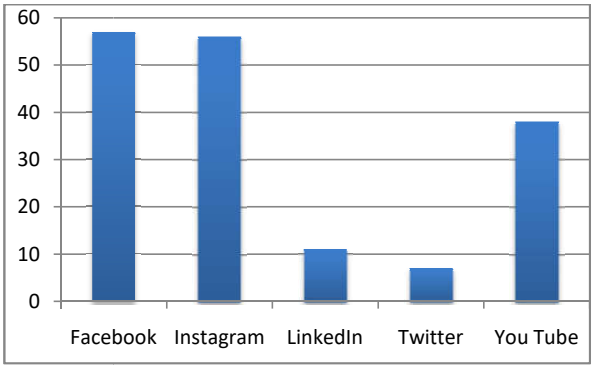
Chart 3. Visiting the web site of higher education institutions



Source: Authors

Respondents were questioned about their presence on social networks. Accordingly, Chart 4.Shows that 98% of them use social network Facebook, 97% Instagram, 66% YouTube, while LinkedIn and Twitter only use 19% and 12% of respondents, respectively.

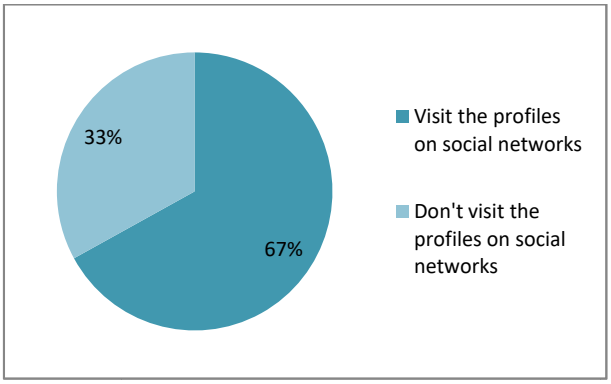
Chart 4. Presence of social networks



Source: Authors

Furthermore, 67% of respondents visit the profiles of higher education institutions on social networks, while 33% of respondents do not, as shown in Chart 5.

Chart 5. Visiting the profiles of higher education institutions on social networks



Source: Authors

5.2. Attitudes of respondents to online advertising of higher education institutions in the area of Tuzla Canton

A total of 62% of respondents stated that prior to enrollment at the higher education institution they had visited websites of the higher education where they collected the information, 21% of the respondents chose the grade 3 - undecided with, whereas 17% expressed dissent as is presented in Table 2.

Table 2. Attitudes of respondents to visiting the websites of higher education institutions when they are collecting information

Before enrolling at college, I visited the websites of higher education institutions to collect information.		
AGREEMENT	**FREQUENCY**	**PERCENTAGE (%)**
1 – strongly disagree	**7**	**12%**
2 – disagree	**3**	**5%**
3 – undecided	**12**	**21%**
4 – agree	**19**	**33%**
5 – strongly agree	**17**	**29%**
TOTAL	**58**	**100%**

Source: Authors

The largest percentage of respondents, 39% of them, agreed with the statement that, prior to the enrollment at the faculty, they visited the user profiles of higher education institutions on social networks when collecting information, 33% expressed disagreement with the mentioned statement, while 28% respondents responded neither to disagree nor to agree with this statement, as shown in Table 3.

Table 3. Attitudes of respondents to visiting the profiles of higher education institutions on social networks, when they are collecting information

Before enrolling at college, I visited the profiles of higher education institutions on social networks, to collect information.		
AGREEMENT	**FREQUENCY**	**PERCENTAGE (%)**
1 – strongly disagree	**12**	**21%**
2 – disagree	**7**	**12%**
3 – undecided	**16**	**28%**
4 – agree	**14**	**24%**
5 – strongly agree	**9**	**15%**
TOTAL	**58**	**100%**

Source: Authors

Table 4 shows that 74% of respondents strongly agree or agree with the statement that online advertising provides future students with the information they need to choose a higher education institution. 17% of them did not have a specific opinion and responded with grade 3 - undecided, while only 9% of the respondents disagreed with the mentioned statement.

Table 4. Attitudes of respondents to the statement that online advertising provides potential students with the information they need, in order to choose a higher education institution

Online advertising provides potential students with the information they need, in order to choose a higher education institution.		
AGREEMENT	**FREQUENCY**	**PERCENTAGE (%)**
1 – strongly disagree	**1**	**2%**
2 – disagree	**4**	**7%**
3 – undecided	**10**	**17%**
4 – agree	**25**	**43%**
5 – strongly agree	**18**	**31%**
TOTAL	**58**	**100%**

Source: Authors

When it comes to the statement that online advertising of higher education institutions in Tuzla Canton influences the choice of study, 36% of respondents are undecided, while 34% of respondents disagree with the statement that online advertising of higher education institutions has influenced the selection of studies. 30% of the respondents expressed their agreement with the mentioned statement, as indicated in Table 5.

Table 5. Attitudes of respondents to the impact of online advertising on their choice of studies

Online advertising of a higher education institution influenced my selection of studies.		
AGREEMENT	**FREQUENCY**	**PERCENTAGE (%)**
1 – strongly disagree	**13**	**22%**
2 – disagree	**7**	**12%**
3 – undecided	**21**	**36%**
4 – agree	**13**	**23%**
5 – strongly agree	**4**	**7%**
TOTAL	**58**	**100%**

Source: Authors

By analyzing the data in Table 6., it can be concluded that as many as 60% of respondents strongly agree or agree with the statement that online advertising of higher education institutions contributes much more than advertising in traditional media. 28% of respondents are undecided with the above, while 12% of respondents disagree with the mentioned statement.

Table 6. Attitudes of respondents to the fact that online advertising contributes to a greater promotion of higher education institutions more than advertising on traditional media

Online advertising contributes to a greater promotion of higher education institutions more than advertising on traditional media (TV, radio, newspapers, magazines)		
AGREEMENT	**FREQUENCY**	**PERCENTAGE (%)**
1 – strongly disagree	**1**	**2%**
2 – disagree	**6**	**10%**
3 – undecided	**16**	**28%**
4 – agree	**13**	**22%**
5 – strongly disagree	**22**	**38%**
TOTAL	**58**	**100%**

Source: Authors

Table 7. Socio-demographic characteristics of respondents

GENDER		
	FREQUENCY	**PERCENTAGE (%)**
Men	**28**	**48%**
Women	**30**	**52%**
AGE		
18-21	**52**	**90%**
22-25	**6**	**10%**
26-29	**0**	**0**
30 years and older	**0**	**0**

Source: Authors

Of the total number of respondents participating in this research, 52% of respondents are women, and 48% are male respondents. Taking into account that the respondents who participated in the study were first year students, the age range of 18 to 21 years makes up 90% of the respondents. Respondents aged 22 to 25 years had a total of 10%, and the age structure between 26 and 29 years, and 30 and over years, were not within the scope of this study.

6. Conclusion

The aim of this paper was to analyze the role of online advertising in the promotion of higher education institutions in Tuzla Canton that conduct related study programs with the programs at the International Business Information Academy Tuzla. All the analyzed higher education institutions are present with their user profiles on at least one social network, and have their own websites. The hypotheses of this paper were:

H_1: *Online advertising of a higher education institution in Tuzla Canton provides future students with the information needed to select a higher education institution.* – accepted.

H_2: *The official web site and social networks user profiles of higher education institutions in Tuzla Canton are important in promoting and informing the public.* – accepted.

Since higher education institutions Tuzla Canton are present on social networks, they send their messages through the online advertising to target and interest the public. Keeping in mind that all respondents use Internet service, they are more often exposed to online world than to traditional media. This fact, together with the attitudes of respondents that online advertising contributes to better promotion of higher education institutions rather than advertising on traditional media, confirms the conclusion that online advertising contributes to greater promotion of higher education institutions in the Tuzla Canton area. Hypothesis H_1 is accepted as the online advertising of a higher education institution in Tuzla region provides future students with information required for the selection of a higher education institution. It is concluded that online advertising has a role in making a choice of a study program, but it is not a determinant factor. Hypothesis H_2 has been proven considering that as many as 98% of students visit the website of a higher education institution. Also, a total of 62% of the respondents expressed their agreement with the fact that prior to enrollment at the faculty they visited the websites of higher education institutions when collecting information, while 40% stated that they agreed with the affirmation that they visited the pages of higher education institutions on social networks. Online advertising in the education sector is a scientific discipline of the contemporary age that is being paid more attention to. This category also includes higher education institutions that provide a specific type of service to their users. Changes in the environment also change the demands and needs of users of higher education institutions (students) and it is necessary to follow these changes based on the application of particular marketing activities and adapt them. Modern access to business brings the needs of service to the fore, and when it comes to higher education institutions, users are the students. The Internet as a global network in Bosnia and Herzegovina has not yet reached its peak and is in the initial stages of development in relation to the most developed countries in the world. It is important to emphasize that the internet is developing at an extraordinary speed, and accordingly all institutions that give importance to contemporary trends need to develop accordingly. With the growth of competition of educational institutions in Bosnia and Herzegovina, i.e. the emergence of private higher education institutions, there was a need to develop marketing strategies to meet the needs of the market, attract potential customers and generate revenue.

According to data from the Agency for Statistics of Bosnia and Herzegovina (2017)., Internet users are 99.0% students, and the largest number of Internet users is between 16 and 24 years old. Taking into account the information provided, advertising on the Internet or online advertising of higher education institutions is an essential tool of today's communication with the target public and as such should be paid great attention. As a recommendation for further research, it is suggested to research the roles and use of online advertising of higher education institutions throughout Bosnia and Herzegovina.

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Review paper / Pregledni rad

THE CHARACTERISTICS OF ONLINE PROMOTION OF BANKS OPERATING UNDER ISLAMIC PRINCIPLES

The Islamic approach to business is specific because of the overall understanding of Islamic economics. Also, Islamic marketing itself is closely related to moral-ethical standards. For Islamic banks, the financing of jobs that are accompanied by a high level of uncertainty, excessive risk, uncertainty in business and speculation are prohibited. In addition, it is forbidden to finance goods, services, and activities that are harmful to the individual and society (alcohol, drugs, gambling, scams, etc.). It is estimated that Muslim buyers make more than 1/5 of the world's population. This size is an important factor for adjusting business and marketing activities to the demands of the Muslim customer segment. In order to bring their services closer to the target group, Islamic banks use the marketing approach used in conventional banking, aligning them with the Sharia law, taking what is allowed, modifying what needs to be changed, and excluding what is forbidden. The rules prescribed by the Qur'an and other Islamic sources are the basis for the design and modification of existing conventional promotional activities, selection of promotional elements and media strategy for promoting the Islamic Bank. The research topic in this paper is the specificity of promotion in banks that operate under Islamic principles and the transfer of best practices in the promotion of these banks. Paper will 48ttack48 the main characteristic of this type of promotion, and show some practical cases of certain Islamic banks. Next to theoretical contributions, and discussion, the paper will set conclusions and different recommendations for decision makers in this area.

Keywords: *online promotion, Islamic banks, banking*

1. Introduction

In the field of Islamic banking, activities that are accompanied by a high level of uncertainty, speculation, excessive risk, are forbidden. In addition to this, it is forbidden to finance products and services that are harmful to the individual and society (alcohol, drugs, gambling, scams, etc.). The Islamic way of doing business does not accept "making money from money". It is estimated that Muslim consumers make 1/5 of the world's population. This size is an important factor for adjusting business and marketing activities to Muslim consumer demand. In order to reach the target group, Islamic banks use the marketing approach of conventional banking, aligned with the Sharia law. Apart from Islamic banks, the concept of Islamic marketing today is applied by a number of world companies. Rules prescribed by the Qur'an are the basis for design and modification of existing conventional promotional activities, by selecting and adapting elements of the promotional mix. The aim is to promote Islamic values as well as to increase trust between clients and banks. The research topic in this paper is the specificity of online promotion in banks that operate under Islamic principles, and to present best practices in this field.

2. Development of Islamic marketing

The interest in understanding the relationship between Islam and consumption and marketing practices has been increasing in recent years. Such interest can be seen in the establishment of specialist journals, the growing number of research articles published, the organization of academic

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conferences and executive workshops and the production of high profile consultancy reports (Sandıkcı, 2011). It is commonly understood that for Muslims, Islam is a complete guide for life. Islam gives directions to its followers on how to be participants in business activities. This is often mentioned in the Qur'an as is the case with the following verse: *O you who have believed, do not consume one's wealth in the unjustly but solely business by mutual consent. And do not kill yourself [or one another]. Indeed, Allah is Ever Merciful to you.*(Quran, An-Nisa 29). This verse has a strong message concerning trading. Islam guides its followers to engage in commercial activities and to refrain from the practice of charging interest/usury. Therefore, commerce is something viewed as essential in Islam, for as long as the process is parallel with Islamic teaching on doing business(Arham, 2010).

Although it has only begun to develop in the last decades, Islamic marketing is definitely a field of research that is expanding very rapidly (IIMA, 2018). The emergence and development of Islamic marketing have also influenced the development of Islamic economics and the application of Islamic principles in business in response to the expansion and strengthening of the global economy. The term Islamic marketing can be viewed in several ways. It can be seen as marketing based on religion (Islam), marketing within the Islamic market itself, marketing coming from the Islamic market, or marketing applied to Islamic markets (Baker, 2011). Each of these views has different characteristics and application. Islamic marketing can be defined as satisfying customer needs through the delivery of Halal products/services, and products and services that are in accordance with the Sharia law, with the consent of the seller and the buyer for the purpose of achieving material and spiritual well-being (Abuznaid, 2012).

Islamic marketing can be defined as satisfying the needs of customers through the delivery of Halal products and services with the consent of the buyer and seller, and with respect to the general principles of marketing and the principles of ethics and faith. Defined by Wilson (2012), Islamic marketing can be defined as an acknowledgement of a God-conscious approach to marketing: from a marketer's and/or consumer's perspective, which draws from the drivers or traits associated with Islam; A school of thought which has a moral compass which tends towards the ethical norms and values of Islam and how Muslim interpret these, from their varying cultural lenses; A multi-layered, dynamic and three-dimensional phenomenon of Muslim and non-Muslim stakeholder engagement, which can be understood by considering the creation of explicit and/or implicit signalling cultural artefacts – facilitated by marketing. Islamic marketing is viewed as marketing that is specialized and specifically related to the needs of Islamic customers. Successful business in Islamic markets demands that marketing is tailored to the specifics of the local market. Islamic marketing combines ethics, religion and trade to achieve the following (Abuznaid, 2012): Providing (creating) real value for the money they pay; Securing real profits for the goods they sell; Creating a realistic image in the minds of Muslim and non-Muslim service providers and products on the size of the market where Muslims live; Establishing the theoretical basis for Islamic marketing that would further enable development and progress in this area. Marketing plays a very important role in fulfilling consumers' needs, besides achieving company goals. In fulfilling these goals, marketers must ensure that all aspects of marketing activities, such as planning of goods and services, pricing and distribution strategies, as well as the promotional techniques used, are in accordance with the regulations stipulated in the Quran and the Sunnah (Abdullah, Ismail Ahmad, 2010).

Strong growth and development of Islamic banks created the need to develop marketing mixes specific to the Islamic economy. The elements of conventional marketing mixes are also accepted in the Islamic economy but have been modified according to Islamic legislation (Norwati, 2012). The modern business environment requires that business adapt to change through adequate responses. Today, in the modern age, in the financial institution's sector, one fact remains constant, and that is the change. Turbulence in the market is constant. Protective mechanisms are abolished, and thus risk increases. In a rapidly changing marketing environment, the need to be customer-focused has never been as important as it is today (Hassan et al., 2008). Consumers know exactly what they want, know the offer and have clearly stated needs. Everyone is more educated and familiar with

the financial sector. Therefore, the marketing of Islamic banks should focus on adapting to changes, retaining existing ones and attracting new customers. Marketing finds its application in different spheres of business and among the various market participants, such as consumers, employees, shareholders, government and various social groups. At the very beginning, Islamic banks did not have the propensity to adopt a marketing concept. Although Islamic banks have shown readiness in recent times and started applying marketing in their work, research shows that insufficient awareness of Islamic banks regarding marketing enhancement (Ozlem, Rice, 2011). Authors in the "Handbook of Islamic Marketing" point out that Islamic banks do not pay enough attention to marketing as a conventional bank. These authors state that Islamic banks have the ability to help people who do not have money but have a good business idea, and that promotion can be based on socio-economic development.

3. Islamic promotion

Promotion is a marketing mix element that is based on communication and whose purpose is to inform, convince customers about the benefit of the promoted product/service. This term includes the entire process of communication between companies and customers, which aims to create a positive attitude towards products and services. A promotion has the role of contributing to the better positioning of products/services that a particular company offers. Banks, both conventional and Islamic, have to find a target market, develop a product, then set the price in line with the price strategy, and finally, through promotional activities, get to know the wider public, potential and existing customers of the product. Sometimes it is possible to carry out the promotion by accruing the general benefits that the customer has from products without emphasizing the superiority of the product of the company. Such a promotion strategy is appropriate when the company is monopolistic or dominant in the market.

The Islamic marketing concept is spiritual, ethical, realistic, and humanistic. All the listed characteristics of the Islamic marketing are transmitted and valid for promotion, as a marketing mix element. All promotional activities carried out as an element of Islamic marketing mix must be in accordance with the Qur'an and the Sunnah. The spiritual characteristic of Islamic marketing obliges Islamic marketers to act in accordance with what God has prescribed. Vendors are obliged to disclose all available information to the buyer as well as the deficiencies they know and which the buyer cannot determine at a glance (of course if they exist). False allegations, unsubstantiated claims, false testimony and overly accentuated emphasis on the positive characteristics of the products are strictly prohibited in the process of promoting the products of Islamic banks.

Promotion, as an element of the marketing mix of Islamic marketing, does not forbid creativity, innovation in promotion to attract new or retain existing customers. However, in this process one must not forget what is prescribed by God, that is, what is banned like scams, lies, injustice, theft, and the like. The Islamic approach to bank promotion contributes to greater confidence of potential and existing clients, takes into account the benefits for all process participants. It is important to emphasize that the promotional activities described are not only relevant to Islamic banks or Islamic companies but are respected by all companies offering products for Muslim and Muslim markets in general. Promotion as an element of the Islamic Bank's marketing mix contains elements that are used in any conventional bank. The basic forms of promotion or communication are the following types of promotions (promotional mix elements) (Kotler, 2005): Economic Propaganda, Public Relations (PR) and Publicity, Sales Promotion, Personal Sales, Internet Marketing.

4. Online promotion

During the past decade, there have been significant changes in general communication, in which the Internet as a medium took over the primacy of conventional media and changed the way companies communicate (Čavalić, 2015). Commercialization of the Internet, as well as the development of the global economy, contributed to the creation of a new concept in business (Čabro et al., 2018). The Internet is considered a network of all networks (Panian, 2005) that allows people to connect and

share information in the world. Banks – strive to make the best performances on the Internet that will show their willingness/intent to meet the needs and wishes of the user. Using the Internet and other digital technologies to achieve marketing goals, and supporting the modern marketing concept is called Internet marketing and has already become a common trend. This type of marketing encompasses both creative and technical aspects of the Internet, including design, development, and promotional messages. The management of Internet marketing encompasses three development phases, namely planning, implementation and control (Kotler, 2005). Despite the rather late beginning of Internet marketing development in Islamic banking, rapid growth and development of marketing interference are evident not only in Islamic banks operating in Islamic countries but also in Islamic banks operating in non-Islamic countries such as the United States and the United Kingdom. Internet banking is increasingly being used by banks and other financial institutions to gain competitive advantages, operational efficiency and faster processing. Late adoption of Internet technology in Islamic banking institutions did not prevent Islamic banks from forming a conventional system for the Internet. Islamic banks still in some countries, due to limited use of the Internet, have room for progress in using this type of marketing.

5. Examples of online promotion of some Islamic banks

In this part of the paper, as an illustration of the specificity of promotion in Islamic banks, concrete examples of promotional activities will be presented. Paper presents the promotional activity of the Dubai Islamic Bank operating in the United Arab Emirates, the Negara Malaysia Bank.

Dubai Islamic Bank is the initiator of development and expansion of Islamic banking in the world. The Dubai Islamic Bank was founded in 1975 and is the first bank to apply (introduced) Islamic principles in all business segments. It is also the largest Islamic bank in the United Arab Emirates. The Dubai Islamic Bank's vision is to become the most advanced financial institution in the world. The mission of this bank is to maintain and improve its position as a world leader in Islamic banking through unmatched customer service, innovation, growth, and consistent employee commitment. In addition to the standard promotional modes that are classic, the Dubai Islamic Bank, as one of the world's most modern financial institutions, uses the Internet for promotion. A bank website can become the instant chat and if a client or potential client wishes to know about a service, the bank can immediately contact the bank employee who will provide it with information. In addition to business information, products, services, the bank's page can also access all promotional messages in the form of commercials on TV, videos, newspaper news archives, and the like. These promotional messages and news are regularly updated and provide information on changes in the bank's business.

Also, the bank is promoted on social networks via YouTube channels, via Facebook, where they regularly update statuses, inform customers about their services, business hours, share pictures, promotional messages, flyers, posters and the like, as well as video facilities. Bank also promotes through Twitter where promotes through short promotional messages. Twitter page of the bank is shown in figure 1.

Figure 1. Twitter page of The Dubai Islamic Bank

Source: https://twitter.com/dibtoday

Through all the promotional messages, texts and videos, the bank introduce the spirit of Islamic principles, beliefs, ideas of justice, equality and honesty, points to the importance of the family, the community we live in, and the importance of mutual assistance, especially those most in need. In addition, messages are precise, clear and can not mislead customers. Generally, the bank turned to customers and used all the channels to communicate with them, to convey the message, attract new customers and existing information about changing conditions, offers, products, or the like. A message from one of the campaigns conducted by Dubai Islamic Bank is "Your family is also our family", promoting a service that is an opportunity to use a family banking service package. Families as a user of this service are provided the privileges that are accurately listed in this campaign.

An example of another campaign message conducted by Dubai Islamic Bank is the message "Confident start of your professional life", whereby banking service packages can be used by the people who base their first employment relationship and within this campaign are provided the privileges and benefits that are explained in detail and which contribute to easier progress and achievement of the goals for people who get their first work experience. Also as a promotion, but also to help people that need help, the Dubai Islamic Bank has established The Dubai Islamic Humanitarian Foundation, a humanitarian foundation that helps the poor. This foundation carries out humanitarian activities, especially during Ramadan, which indirectly helps promote this bank.One such action was conducted in 2012 and has assisted 3.500 families.

The Negara Malaysia Bank was established on 26 January 1959 by the Central Bank of Malaysia. This financial institution is fully owned by the government. The Bank reports to the Ministry of Finance of Malaysia and informs them of the monetary and financial sector. Among the main roles of the bank is the promotion of monetary policy goals. The Bank is also responsible for maintaining the stability of the financial system and for building a healthy and progressive financial sector. The Bank also plays an important role in building efficient payment transactions, as well as the work of other institutions, such as the Securities Commission, Credit Guarantee Corporation, and similar bodies in Malaysia. Through its work, the bank facilitates easier access to financial services, both for natural and legal persons, thereby supporting balanced economic growth. This bank has the role of a government adviser, an advisory body on macroeconomic policy, public debt management, and has the authority to issue currency. The Bank covers seven areas: the economy and monetary

policy, investment, regulation, payment transactions, supervision, development, communication/promotion.

The Bank is actively participating in online social networks - Facebook, Tweeter, a channel on YouTube, which regularly updates. The user can enter all social networks/channels via shortcuts on the bank's page. It also provides direct contact via e-mail by clicking on the shortcut email. The Bank implements population education programs and motivates other banks to carry out the education of service users, thus contributing to increasing the financial literacy of the population. Given that today's financial market is sophisticated and complex, the bank has launched an education program, through which it promotes the characteristics of the products and services. In this way, companies and regular users can be introduced to the products and services offered by banks and financial institutions, as well as the possibilities to use them more efficiently. They also encourage other banks to organize similar programs in Malaysia. Its program is implemented in schools among children, but also in rural areas. The Bank advises financial service users through emphasizing the importance of reading a warranty guarantee agreement, using ATMs, the possibility of misuse of personal documents (and their copies, and the like).

Also, the Negara Malaysia website is promoting other portals and pages that are educational for banking service users and can help them avoid scams or misuse when using some of the banking services. One of those sites, sponsored by Negara Malaysia, users can get financial advice, plan their finances, budget, or join one of the education programs organized by Negara Malaysia. Negara Malaysia also participates in public actions that contribute to the development of security and the protection of individuals. The Bank is committed to respecting and applying Islamic principles and participates in strengthening and supporting the community and strives to reduce the number of fraud/misuse of personal data of financial service users in Malaysia. Through bank websites, banking service users are advised not to give their personal information/card information to anyone, and they are provided with the possibility of contacting the Banca Negara Malesia contact center as an advisor in these situations. Negara Bank Malaysia is trying to promote itself, but also to reach other banks for public promotion. Research conducted by the bank improves understanding of finances and gives insight into the real problems faced by clients. It has a double significance. First of all, information is gathered in order to design education and promotion programs, and then for appropriate state-level decisions.

6. Conclusion

The trend of Islamic promotion on the Internet, as shown in the paper, is in the rise. In line with market changes and the greater appreciation of the Muslim customer, it is necessary to respond to such challenges in marketing. Islamic banks that are presented in the paper as examples of good practices. Banks are establishing an online promotion that is carried out in accordance with the values of Islam but also fulfilling the desired results of the promotion. Banks' promotional messages are precise, do not give the possibility of misunderstanding, and in the end, there are no differences in the actual offer and promotions. Given that today's financial market is sophisticated and complex, banks have initiated an education program, and through the same promotion the characteristics of the products and services in order to make it easier for legal and natural persons to become familiar with it and to use it more efficiently. World-renowned Islamic banks carry out customer protection programs, inform them of possible abuses, and in this way, other than the benefits to the community, create a positive perception among potential clients. There are still many positive examples in the world, which should be the subject of further papers and research on this topic. Accordingly, it is recommended to all companies working with Muslims to try to change their marketing communications, according to the Islamic requests. It is also recommended that researchers further explore this interesting and dynamic topic within marketing.

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MARKET COMMUNICATIONS AND SOCIAL QUESTIONS IN DIGITAL WORLD

Abstract

Modern information technology takes the lead in relation to traditional media and advertising, and significantly changes the sender / receiver relationship, which has led to significant changes in marketing communication and business with potential buyers.The subject of this paper is electronic marketing or e-marketing, as a new branch of marketing, which implies marketing activities through the use of information technology.Unlike past passive roles he had during the use of traditional media when the message in the form of advertising and advertising was one-way, the buyer becomes an active recipient of information with the possibility of communicating with the sender. Interactivity is precisely imposed as a new marketing concept for advertising and sales purposes.The aim of the research in this paper is to explore new social issues that emerge through the use of digital technologies, particularly ethical, that relate to the influence of social trends based on the use of personal data as well as the protection of the same, the dignity and freedom of the individual as well as the functioning of the democracy of the digital society at all.

Key words:*marketing, communication, digital technology, social issues*

1. Introduction

As it was before with urbanization, then by globalization, digitalization has recently sparked all spheres of human interest and society in its entirety, from education to culture to economy. Consequently, traditional media just like the traditional professions have a questionable future and it is difficult to predict the consequences of digitization and new communication technologies that change theoretical paradigms. There is a need for new skills and knowledge in different professions, but also for all the new professions that are called digital jobs in digital affairs, resulting in the need for systematic changes in education that becomes lifelong because the digitalization process requires constant learning.

Digital economy opens up new markets and new jobs. The digital industry has become a leading industry, and media literacy has become an imperative. Communication between the buyer / consumer and the seller / provider of products and services is now „online“ or via the internet. The internet, and especially the mobile Internet imposed by the massive use of „smart phones“, is now in the marketing sense of something like a product fair where it is possible to buy everything.

The very availability of a wide range of products and services makes electronic marketing or e-marketing perhaps the most important branch of 21st century marketing. Online flyers, commercials, cookies, registrations, ... are all marketing tricks in digital communication that are intended to attract the consumer. E-marketing thus offers the opportunity to develop new products and markets as well as new channels.

Interactivity as a marketing concept requires the customer to actively access the marketing space mostly through on-line product reviews and webshop sites and email communications. The well-known term „quality management“ gains a completely new dimension, which also includes the

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customer. Quality management aims to meet the customer's requirements, and only a quality product can keep the old and win a new customer, ie become, remain and be competitive on the market.

There are a number of social issues that are causing and causing concern with the increasing use of digital technologies for marketing purposes, such as ownership of immaterial data, the role of privacy in the virtual world, the use and abuse of personal data, data collection, but especially the issue of inclusion and protection children in the digital world.

Therefore, a series of efforts have been made in the form of legal and ethical regulations, from those recommended to those who are committed but also to a range of campaigns to protect dignity and the free individual globally, but also at all the lower levels of society. Although ethics has been studying for more than two millennia, its application in the digital world is a whole new challenge for theorists. Digital processes require constant engagement of the wider community for the safe use of digital technologies.

2. The e-marketing

Online marketing is a set of activities aimed at selling products and services to target consumers, using the Internet and online services, using on-line tools and services in a way consistent with the overall marketing of the company (Stankić, 2014).

The appearance of the internet has allowed great changes in the promotion mode, primarily more efficient advertising with reduced costs, high speeds of broadband and a wide range of users that can be accessed, and what is impossible in traditional media - track effects and results in real time.[4]

Studies conducted in 2006 found why people were opening and responding to e-mail (Levinson, 2015):

- These products or services (54%),
- Message text (40%),
- Message Home (35%),
- Attractive offers (discounts, free delivery) (33%).

Online marketing represents inexpensive and direct communication with digital media users. Online marketing services include the use of a comprehensive and systematic strategy that begins with the conceptual solution and planning of a promotional campaign, after which it is moving through the realization (design, creation and installation of online). Online marketing has gone a long way in development and today there are many promotional activities available such as:

1. Search Engine Optimization (SEO) Optimization - The goal is to gain as high a rank as possible in search results, which causes increased web visibility. Websites optimized by SEO principles are the basis for increasing the number of queries, the amount of products sold, and the higher availability of target groups. With SEO optimization, it's also important to tailor content to users to keep it on the web. It should be stressed that SEO optimization requires the time and effort of the ordering processors and contractors involved in the process. It is necessary to continually work and keep up to date with new search engine applications and algorithms.
2. Advertising on search engines, social media marketing (PAM) - PPC campaigns are paid for form on the first page of search engines. Ads appear next to search results for specific keywords. This form of advertising is possible on all search engines, on a large number of domestic and foreign web sites and sites on social networks. The advantage of this form of advertising in relation to traditional forms is the ability to have extraordinary tracking, information about how many times an ad is clicked, to the information from which countries

[4] www.dimedia. hr

and cities come to the vast majority of visitors, and a host of invaluable information. The biggest advantage is that only an ad click is paid, while ad serving is completely free! In other words, only when an interested visitor wants to know more about the product or service you are interested in.

3. Other online activities allow you to combine creative ideas, marketing with great reach and transparency. Social networks such as Facebook, YouTube, Twitter and the like today have become so significant that they are an inevitable part of the company's presentation and communication on the Internet and represent the shortest channel of communication with the user. The rapid development of social networks and their impact is evidenced by the regularly high-ranking results on Facebook, Twitter search engines, as well as nearly 100 percent of the videos coming from YouTube.

The benefits of social networks are (Kanižaj, 2017):

- Easy to use,
- Massive number of users,
- Targeted Public Communication,
- Cheap Advertising,
- Rapidly expanding advertising,
- Free use.

The disadvantages of social networks are (Kanižaj, 2017):

- Communication via image or video only,
- Loss of copyright,
- Loss of privacy,
- Limited number of words (tags),
- Loss of time and addiction,
- False presentation.

Online shopping (online shopping, web shopping) is a process where customers purchase services and products directly from the real-time merchant via the Internet and this form is called Ecommerce. Online stores, online stores, web stores, web stores or virtual stores are analogous to buying services and products in a physical store or a shopping center. (https://hr.wikipedia.org).

Online commerce can generally be divided into two main areas:

- Trade between Business Entities -Business to Business Store or B2B,
- Consumer-centered consumer-oriented retail trade - Business to Customer or B2C.

Internet commerce is most commonly part of the web business and is today considered one of the most profitable types of commerce. Advantageous is the uncomplicated logistics and the relatively low running and running costs, and consists of distribution, trade, marketing, and sales.

One of the most popular internet commerce definitions is what Panian (2000) has defined as an „internet shop“ as a process of buying, selling or exchanging products, services or information through a publicly available computer network, the internet, and offers a great deal of cost and time reduction.

Since all physical stores (classical stores) can replace a single web shop, it's considerably cheaper to have an internet store. The web commerce business has many parallel to the classical business process business because of business operations, business deals, delivery of goods (products or services), and payments made electronically, such as cashless payments. The most common form of payment is credit cards.

According to Hulten, an internet store exponential growth and great popularity may be thanks to the many benefits it has in comparison to the classic way of trading. These advantages are shared with the benefits that are good for the buyers and the society as a whole, and the advantages that are good for bidders, ie sellers (Babić, Krajnović, Radman Peša, 2011).

Internet commerce is practical, simple and fun. Customers avoid crowds, do not have to communicate with sales staff, thus saving their time. Also an internet store is available from 0 to 24 hours, and the buyer has the option of choosing the best product.

3. Interactivity as s marketing concepr

Interactive marketing is a new direction in marketing that is geared towards conducting dialogue and tracking transactions. It is a process that started at the beginning of the 90's as a new way of communicating the services of the marketplace service provider, and follows the activities of a particular customer and on that basis responds to change.

It includes all communication components that begin the interaction - two-way communication with consumers (listeners, viewers, visitors, guests) who want to be involved from the very beginning to launching products or services on the market (communication with the brand), and becomes an axiom of business for modern companies.

Communication forms are directly related to the basic functions of communication in marketing, such as attracting attention, creating interests, creating a favorable predisposition and encouraging shopping.

In view of the above, forms of integrated marketing communication are (Kesić, 2003):

- Advertising,
- Direct Marketing Communication,
- Sales promotion,
- Personal sales,
- Public Relations, i
- Publicity.

According to (Kesić, 2003):

- Advertising is a paid, massive form of communication of specific content with a view to informing, reminding and encouraging a potential buyer to act in relation to a particular idea, product or service,
- The company directly communicates with the target segment, in order to generate direct reactions,
- Sales promotion can be defined as a form of direct incentive that offers extra value or encourages sellers, distributors or immediate consumers with the primary purpose of current sales.
- Personal sales represent a mutual form of communication that implies direct two-way communication,
- Public relations is a strategic long-term planned activity that generates positive public opinion about the company, its product, its services and concerns for people and the environment, to create the conditions for other marketing communication activities in achieving a positive image and more efficient business,
- Publicity - Unpaid form of promotion that can be used through any mass media targeting the target segment.

Interactive marketing communication has enabled the development of technology that connects consumers, as well as enterprises and employees to the B2B marketplace, and brings them a new environment that needs to be adapted quickly. This communication requires constant presence, real-time availability, fast flow of information and usefulness for all involved parties.

Mobile marketing has become interesting to companies that have started using internet marketing to promote their products and services. Research has proven the positive effect of promotional e-marketing on users. Communication via electronic devices has become precision, convenient and tailored to the needs of potential consumers. This creates a unique quality of relationship and

adjusts the promotional activity of the company. It is a prerequisite to have the permission to promote via virtual means.

The new technology has put entrepreneurs into launching a new way of electronic business, or opening an Internet company. The emergence of new intermediaries has led to the situation that many economic operators have had to re-examine their business and meet the wishes and needs of users. Computer manufacturers, bookstore owners, flower shops, music stores and tourist agencies have begun to think about product sales via the internet, which has become the business base (e-business) (www.poslovni.hr).

4. (No) security of digital world

Using digital services can potentially cause a series of dangers, especially when it comes to protecting children, as well as protecting young people, as well as protecting data and privacy.

When it comes to the security of the digital world, there are many dangers that „shake“ on social networks, such as: social networking, cyber-bulging, harassment, violence, and misuse of information that is being broadcast.

On social networks, many people often publish personal information: their real name, family name, phone number, personal photo, and other personal information without any hesitation. Generally, the Internet often reveals many of the information about themselves because they forget to include the possibility of protecting privacy or by giving more data than is necessary (Aftab, 2003).

According to Šimović and Ružić-Baf (2013), some users in their social network profile leave too much personal information in electronic form that malicious people can use for negative purposes. Employers may also use this information. It is not uncommon for social network users to set a date when they go on holiday (eg on the seas next week ...), which can also take advantage of neighborhood thieves. The problem of social networks is malicious code breaking by Facebook profiles and mail systems and identity theft. Even pedophiles, murderers, etc., can take advantage of social networking information.

According to the data published by UNICEF under the title „Children in the digital world“ about the state of the world's children in 2017, every third user of the Internet is a child. UNICEF's first comprehensive overview of the various ways in which digital technology affects the lives of children and the chances of living „Children in the Digital World,“ apart from the opportunities that technology provides, identifies the risks that this technology brings.

The report warns that governments and the private sector do not keep up with the changes, and that more children are exposed to new risks and dangers. The report also points out that very little is done to protect children from the dangers in the digital world as well as to the spread of secure online content. Although the internet is designed for adults, it is increasingly used by young people and children, the UNICEFA report says that young people are the most visually elite on the Internet, and that around the world, 71 percent of young people have internet access, compared to 48 percent of the total population (Unicef, 2017).

With the necessarily digital literacy of children and families themselves, there is a need for joint action by the academic community, children's institutions, the private sector and governments to make digital technologies safer for children and young people. Apart from the protection of young people and children, the protection of privacy and identity of all digital technology users is an extremely important issue in recent times.

According to Conry-Murray and Weafer (2005), identity on the internet consists of a series of elements such as usernames, passwords, unique parent numbers, various account numbers, and other personal information. These digital identities work on the assumption that you are the only person who knows your information. This is a bad assumption and makes it easier for criminals to commit a crime.

In the digital world there is more and more virtual disturbance. Težak (2010) under virtual harassment implies the use of information and communication technology, especially the Internet, which individuals or groups use to assign to other individuals, groups, or organizations. It includes guilty accusation, monitoring, threats, identity theft, and gathering information for constant harassment.

In the digital world in the area of endangering the security of identity and personal data of users are included (Rajko, 2011):

- Traditional methods of identity theft (for example, documents),
- *Phishing* (False E-mail),
- *Pharming* (False Web Site),
- *Spyware* (applications that monitor the work of a computer user to access data such as pins, passwords, credit card numbers, etc.).

From the foregoing it is evident that the presence in the digital world is endangered in different ways and that users are exposed to numerous dangers can endanger their personal identity. According to Osamanbegović (2001), a large number of social network security incidents are not a direct consequence of malicious attacks or attacks by criminal persons, but have been caused by poor social network protection, security vulnerabilities in used technologies, and also due to the neglect of users.

One of the fundamental human rights is the right to protection of personality that is protected by the provisions of international and national legislation, ie protection of the character, appearance, voice, emotion, talent, intelligence, dignity, honor and reputation. According to Horvat and Živković (2012), personality is a moral and „non-possessive asset", which makes a person a personality and in which people are different. Legal personality is the right of every individual to seek from others, especially from the state, respect and free development of their personality.

The right to the protection of personal data, according to Klarić (2016), as well as legal personality and privacy, is one of the most important human rights. It is a fundamental human right regulated by the laws of different states. With the development of technology and its ever more active presence in the digital world, this right becomes ever more important because it can often witness its direct administrative baptism in the digital world. Namely, the Internet as a global viral network does not know national boundaries or barriers, and the protection of personal data is under the jurisdiction of national legislation, and the protection of personality has become a global problem.

In order to protect the digital world from dangers that are constantly threatened, it is necessary to work on the development of digital intelligence (DQ), which, unlike intelligence (IQ), newer and future, will be decisive for personal social well-being. Digital Intelligence (DQ) is evaluated through the passage of the appropriate test:

- *Identity of a „digital citizen"* - measured by its ability to create and maintain a healthy identity both online and offline,
- *Managing time spent online* - implies that a person is capable of running multiple jobs simultaneously online, but also controlling their time and behavior on the network,
- *Identifying online attacks and violence* - measuring the ability and capacity to identify online attacks and violence and to have a blue,
- *Code behavior and data protection* - is related to personal cyber security that depends on the individual,
- *Sharing your own and other private information* - this can lead to great discomfort and dangers, which digitally intelligent people do not do,
- *Critical thinking* - making the difference between accurate and misleading information, good and bad content, honest and suspicious contacts,
- *Digital traces that you leave online* - this can have problems in „real" life,
- *Digital Empathy* - Measures compassion with the needs and emotions of others online.

Of great importance is the development of digital intelligence or shortened DQ which represents a series of social, emotional and cognitive skills that enable a person to face the challenges and potential dangers of the digital world. These skills can be divided into 8 major areas - skills:

- *Digital identity* - how to set up and create a personal identity and your own reputation in the digital world
- *Digital Use* - Developing the skills of using digital devices and establishing balance between online time spent and real-life participation
- *Digital Security* - the ability to detect digital / Internet threats and use of its own defense and data protection tools
- *Digital safeness* - awareness and risk management skills and hazardous content management and protection methods
- *Digital Emotional Intelligence* - empathy skills and skills in building good online relationships
- *Digital communication* - the ability to communicate and collaborate with others in the common use of digital technologies and media
- *Digital literacy* - the ability to find Internet content, their estimates, and the use of that creation, as well as ways to share this content with others
- *Digital rights* - the ability to understand and preserve personal rights, including the right to privacy, intellectual property, freedom of speech and hate speech protection.

The EU data protection rules incorporated in the EU Data Protection Regulation (or the OUZP) describe various situations where companies and organizations can collect or reuse your personal information:

- When signing a contract with you, such as the delivery of goods or services (ie when you buy something on the internet) or work contract,
- When they fulfill a legal obligation, for example, when processing your data is legally mandatory, for example, when your employer provides your social security officer with information on your monthly salary to gain social security rights,
- When data processing is of vital importance to you, for example when it can save you life, in fulfilling your public interest tasks, mainly related to public administration tasks such as schools, hospitals and municipalities,
- When there are legitimate interests - for example, your bank uses your personal information to check if you are entitled to a higher interest rate savings account.

In all other situations, an enterprise or organization must seek your consent („cajolement „) before collecting or re-using your personal information (https://europa.eu).

The privilege of using the data is given by a clear affirmative action, for example, in the case that a user wishes to receive a marketing message by electronic mail. The user also has the option to withdraw their consent at any time, after which the previously processed data should no longer be used. It is also important to note the „right to forget“ that every user has the right to call if he or she wants to make their internet information unavailable, for example, if they are used illegally or are no longer needed. For example, who may request deletion of data from a search such as Google, arguing that the data is irrelevant, inaccurate or inappropriate.

Ethical codes are revised to suit changing circumstances and new issues arising from advances in the use of digital technologies. Digital technology is a major challenge to marketing ethics because the unlimited possibilities that digitization provides requires a constant assessment of their implications.

5. Conclusion

With the use of digital tools and platforms with application in everyday life and work, there is a strong need for the development of digital, informatic and media literacy through lifelong learning.

Particularly important is investment in human resources, improvement of the method by improving the existing and finding a new staff with an emphasis on learning the skills of the future, which can be achieved primarily through the adaptation of educational programs and the implementation of active training measures in the field of education for digital affairs. The unique digital market, albeit guaranteeing a range of features, also brings a number of dangers especially for the protection of children and young people, as well as protection of data and privacy at all. Real security shortages in digital technologies actually jeopardize both the economy and society. Therefore, measures to protect citizens, society and the economy are the responsibility of public bodies for the purpose of enhancing digital technology and services, prosperity, economic stability and a healthy environment.

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Links:

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Review paper / Pregledni rad

ARTIFICIAL INTELLIGENCE AND NEUROMARKETING

Abstract

Today, mankind faces two major challenges: technology and human potential. Artificial Intelligence has been stirring ghosts among analysts, journalists and great minds for some time, who are worried that robots will replace them in their workplaces. On the other hand, artificial intelligence created chatbots and thus improved the user experience, becoming one of the most powerful modern tool for digital marketing experts. The application of machine learning in marketing increasingly helps to understand and predict human behavior. Its implementation results in customer based marketing strategy, while analysing key factors of their behavior: income, percentage of price difference, market share, liquidity, customer value in the long run and the likelihood of customer retention. The aim of this paper is to explore the areas and possibilities of implementation artificial intelligence in marketing. Main focus of the work is on neuromarketing, as a special symbiosis of marketing, medicine and technology, which provides a more comprehensive insight into consumer behavior, creating a new dimension of the basics of Behavioralism. By using the method of content analysis of available scientific publications, the work systematizes the benefits and disadvantages of neuromarketing in the modern business. Nevertheless, despite a number of advantages that neuromarketing provides in research, the controversy over the ethics of its application continues to exist, which is also the subject of the author's discussion in the final deliberations.

Keywords: artificial intelligence, marketing, neuromarketing, consumers

1. Artificial intelligence

In the new age we have to learn to predict the future based on the present. Humanity today faces two major challenges: technology and human potential. High tech / high touch is a formula that is used to describe how people react to technology (Naisbitt, 1982). When new technology is introduced into society, people must respond appropriately, otherwise technology is discarded. The more we are surrounded by high technology, the greater the need for human touch. High tech / high touch is a principle that symbolizes the need to balance the physical and spiritual reality. This also applies to electronic marketing.

Artificial Intelligence (AI) can be defined as a computer-based analytical process that seeks to create computer systems that are commonly called intelligent. The essence is complex computer solutions and smart algorithms that closely monitor and enhance our everyday digital-mobile life, but also „learn“ based on collected data on human behavior. It allows us to „talk“ with Apple Siri, get relevant search results on search engines, and use a host of social networking options.

From the economic aspect, expert systems are the most important part of artificial intelligence. They are trying to emulate the human process of thinking, including thinking and optimization.

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Knowledge is presented in the form of a set of „if-then“ rules in the form of a knowledge base. In this way, artificial intelligence can become a significant tool in the formation and implementation of company marketing strategies.

Yet despite the many benefits that artificial intelligence provides, its appearance has caused a variety of reactions, including ghosts among analysts, journalists, and minds, and all those who take care of replacing them with their workplaces.

Below we will generate reviews of current literature and research in the area of artificial intelligence application, especially in the field of marketing and neuromarketing. The paper will summarize the key advantages and disadvantages of using artificial intelligence as well as the ethical issues that arise, with practical examples, implications and conclusions on the subject matter.

2. Review of literature

Contemporary scientific publication increasingly focuses on artificial intelligence, irrespective of areas of research and its application. The research highlighted different perceptions, both positive and negative.

One of the notions of the application of the artificial intelligence system is that it can also result in the design of a marketing strategy towards customers by using five factors that describe their behavior: revenue, percentage difference in price, market share, liquidity, long-term customer value, and likelihood of customer retention. Expert systems help „immerse“ the data and identify the most abundant buyers, classify buyers into groups, and plan the appropriate marketing strategy (Markić, Bijakšić, Šantić, 2016). Today in the world, where consumer attention is difficult to keep, to attract new customers chatbots are one of the best choices (De Vivo, 2017)

Vides defines human beings as visceral, reacting to certain stimuli, forming their feelings, leaving aside logic and rational thinking (Vides, 2016). Analogously, one can conclude that one of the most important disciplines of artificial intelligence application would then be neuromarketing, which is actually an analysis of the decision-making process in human beings, in order to increase the effectiveness of promotional campaigns. FMRI scans have shown convincing evidence that different factors affect how and why consumers accept certain brands and buy their products even at higher prices than competitors.

According to Ćorović, the success of neuromarketing projects is measured by the increase in sales. Companies need to invest in neuromarketing when they want consumers to think about it and when they want to sell more. Neuromarketing improves the scientific way and explains why certain people can more effectively influence others. It helps to focus on decision-makers and does not talk about products, services, and companies (Ćorović, 2016).

In a free market of competitive ideas, the consumer is the boss, and it will remain so. Giant corporations continue to grow but also fall under the pressure of consumers. Based on their competitive ability to better satisfy the desires and needs of consumers, they are increasingly competing in the market. Regarding this, Pradeep emphasizes the function of non-market marketing as a competitive advantage over the overwhelming and overwhelming market. While people live in different countries with different cultures and speak different languages, the „brain language“ is universal and opens the door to global norms. Neuromarketing has changed every aspect of brand, product, packaging, trade, and advertising and has enabled a number of sources of competitive advantage (Pradeep, 2010).

At the same time some scolars prefer to be more cautious when it comes to neuromarketing. For example, Wilson and his colleagues argue that there is a potential restriction of free will and privacy invasiveness as a result of neuroimaging technology and therefore it needs to be controled by governmental and academic constituencies (Wilson, Gaines, Hill, 2008). But with a new age of digital world, more and more scolars are changing their attitude.

When looking into the future, some neuromarketing deficiencies may disappear when a new development is made. The techniques will become more advanced and more accessible. It is already possible to buy eye-catchers! Therefore, marketers need to keep in mind the needs of their consumers. However Odekerken believes that neuromarketing should be cautiously accessed. Both traditional marketing and neuromarketing have their advantages and disadvantages (Odekerken, 2018). They tell us something about how consumers (or people in general) make decisions, whether they are conscious or subconscious, and can be abusing them.

Continuing this paper we will systematize the advantages, disadvantages and possibilities of using artificial intelligence as well as non-marketing.

3. Application of artifical intelligence in modern marketing

When talking about applying artificial intelligence to marketing, it is important to point out that the contemporary business of every company in greater or lesser intensity implies some form of artificial intelligence. At the growing level of integration of artificial intelligence into marketing, the following is achieved:

1) Mass Data Analysis

In the past private labels and agencies have employed data team analysts. However, while the team of analysts prepared the database, the data in them was already outdated. With the appearance of artificial intelligence analysis and data processing becomes less and more demanding and increasingly efficient. This means that analysts need less time to analyze data and have more time to find answers to questions about them.

Today, science becomes more and more accessible because of modern computer infrastructure that supports artificial intelligence and machine learning such as Amazon AWS plus Apache Spark, Google Cloud Machine Learning Engine, and Microsoft Azure Machine Learning Studio.

2) Understanding Buyer Behavior

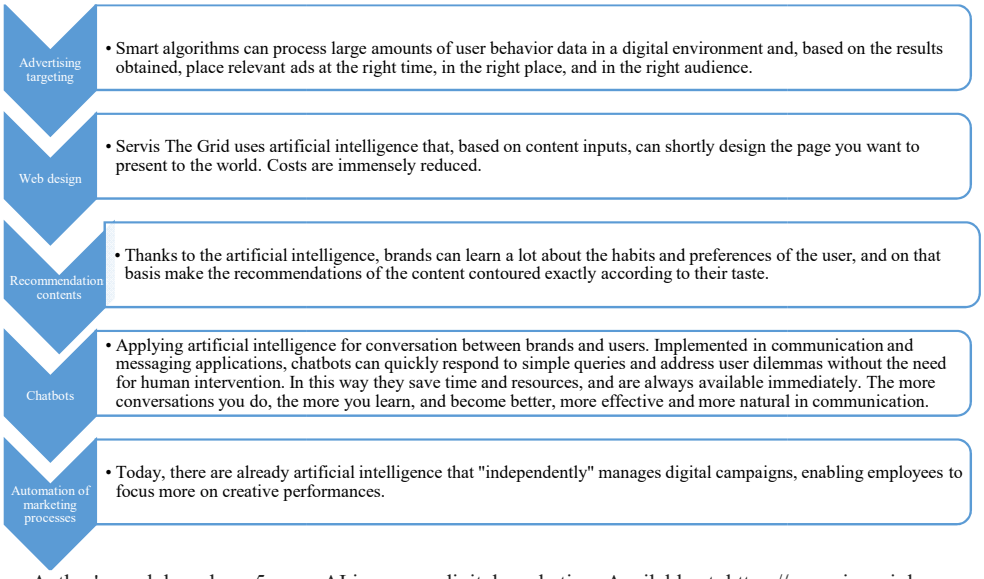
In marketing, machine learning is increasingly helping to predict human behavior, which allows it to create additional value for the consumer. Advertising campaigns that apply artificial intelligence can analyze whether a consumer responds well to a particular ad and so adjusts it for the next release.

3) Improving user experience

Artificial intelligence already has a major impact on user experience with tools such as Google Assistant, Amazon Alexa, and Apple Siri. These tools have become a major part of our daily life and their role will grow more and more. Artificial Intelligence Marketers can use to improve data processing, mapping consumer times, optimizing bids, and improving overall user experience.

Digital marketing, which is increasingly taking pride, especially in global business, is fundamentally based on artificial intelligence. Their symbiosis is best reflected through five key elements: 1) advertising targeting, 2) web design, 3) content recommendations, 4) chatbots, and 5) automation of marketing processes. The essence of all of the above elements is visible from the picture below.

Figure 1. - Elements of application of artificial intelligence in digital marketing



Source: Author's work based on: 5 ways AI improves digital marketing. Available at: https://www.jasnoiglasno.com/5-nacina-koje-ai-unaprjeduje-digitalni-marketing-8048/ Accessed: 27/11/2018.

One obvious example of artificial intelligence in digital commerce is RankBrain, launched in 2015 by Google, a robotic learning system that uses artificial intelligence to respond to user queries just like that, in order to respond to the human being. For example, if you ask Google how old is Bill Gates, it will give you the answer to the question asked by the date of the query.

In addition to answering the question, Google also offers answers to a series of similar queries that users often type into the Google search engine. All of these results provide artificial intelligence. To respond to a query, artificial intelligence uses previous data sets collected from other users' searches. In this way, Google constantly „teaches and imitates human intelligence“, which means that it has long been not necessary for its creators to manually „feed“ its huge database. Although it sounds a bit scary, artificial intelligence in the digital marketing world is more than welcome.

There are many benefits from the use of AI, especially in the modern marketing business of the company. Below are some of the reasons for their application.

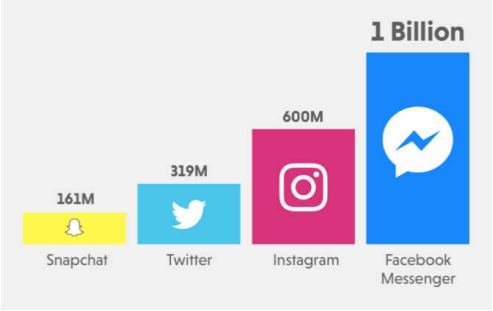
3.1. Artificial intelligence gave chatbots and thus improved user experience

Chatbots are one of the most powerful tools available today for digital marketing professionals. They were created to emulate a human conversation, and for the Facebook Messenger app they were developed at least 100,000. Chatbots can respond to a user's message in real time and conduct conversations just like a human. They are a real miracle of artificial intelligence, they just need to be able to use them in the right way.

It is important to keep customers in order to successfully operate each company. It is necessary to keep the customers' attention through their positive experience until the end of the sales chain and thus ensure that it will talk about your brand. This means that such products will also be recommended to friends. If 74% of consumers talk about positive reviews over the Internet, they have gained confidence in your business, and you, relying on satisfied customers, are opening up opportunities to attract new business. Small and medium-sized businesses should be able to include chatbots in their current purchase plan. Today in the world, where consumers' attention is difficult to keep, chat rooms are one of the best choices to attract new customers (De Vivo, 2017). There are

many opportunities Chatbot can perform. Facebook Messenger has recently topped Facebook by number of visits, which shows the increasing popularity of this app. Figure 2 shows the ratio of the number of users to Snapchat, Twitter, Instagram and Facebook Messenger.

Figure 2. - The ratio of the number of users to Snapchat, Twitter, Instagram and Facebook Messenger



Source: What is chatbot? Available at: https://chatbot.com.hr/sto-je-chatbot/ Retrieved on: 23/11/148.

It can be concluded that the number of Facebook Messenger users is equal to the number of users Snapchat, Twitter and Instagram together. Messenger has so far been an application designed to talk to a person with a person. That changed with the bots. There is no longer a limitation in communication with just one person, but it is possible to create a huge amount of users within the fastest growing mobile application in the world.

3.2. The power to create personalized content marketing

Every marketer should know how much of a major role online content plays in all marketing strategies, because detailed content is the foundation of any successful online campaign. Artificial Intelligence uses an algorithm whereby a smart program generates content with the best combination of keywords that will attract readers and persuade them to do what you want (e.g., open the newsletter, press like on the page, or download an e-book). For online marketing campaigns, this means saving time. There are already software that geneier the sentence and up to 600 characters for marketing platforms such as email and social media. Some software can even, based on previous campaigns, create an emotional user profile by which they create a personalized message in the same language.

Although this may sound like machines will take away our jobs, copywriters should not be afraid. Machine-generated content processes content based on an algorithm that provides details and research needed to write about a topic. Although the programs have written almost the entire article, it is based on facts, and we still need people to add personality, humor and a little more humanity to the content.

3.3. More accurate online audience targeting

Today data can be found anywhere and processed into information (insight), which digital marketing experts can use to make marketing decisions. One such example is Facebook Insights, in which we can see who lies, hides publications, from which part of the world our fans come, what they like and what gender are. We can get this information (and much more in detail) from Google Analytics and many other programs. Therefore, in the future there will be no need for speculation, constant testing and experimentation. Today's analysis tools are far more accurate than those in traditional advertising, so artificial intelligence of difficult decisions will be made for us.

3.4. Forecasting and consulting the audience on related products

It is practically impossible to directly determine what happens in the consumer's mind. Often, consumers do not know how to explain the reasons for their behavior, or they simply will not reveal their hidden motives. In such cases, the only way out was the use of psychology and certain

techniques that help identify processes and crucial factors of influence in consumer awareness and thinking (Tihi, Čičić, Brkić, 2006). In order to improve user experience, many companies use artificial intelligence to track the habits and desires of their consumers, in order to place products that they believe their users will be interested in.
Regarding this it is possible to apply virtual upsell based on the software program. This intelligent upsell promotes products that it thinks consumers will want, and they are not even aware of it. The software monitors and analyzes the habits and consumption of each consumer and, with the help of collected data, suggests products that might interest them, which automatically means increasing sales.

3.5. Identifying online visual content

The technology of visual content recognition itself has lasted for some time. Most online users are familiar with the ability to tag (tag) friends on social networks, but there are still individuals who are surprised how Facebook recognizes the faces of users. Today, there are many opportunities that Visual Content Recognition Technology can provide in the marketing world.
In the marketing world slowly, but surely, the practice of visual listening is developing. This means that smart apps can recognize visual content and analyze ads that attract audiences most. With the information obtained, companies can monitor photo patterns and get to know their audience through the photos they share most often. With AI, the ability to recognize visual content can become a powerful interactive marketing tool. For example, Macy's clothing store, has upgraded an existing application with a visual content recognition program to make it easier for buyers to find products they might like. Customers just need to photograph a piece of clothing they like and the app will give them suggestions for all similar products currently in store.

4. Neuromarketing

By definition, neuromarketing is the study of the way people's brain reacts to advertising and other brand-related messages by scientifically monitoring the activity of brain waves, eye tracking, and skin response. Neuromarketing represents an analysis of the decision-making process in human beings, and then uses results to increase the effectiveness of promotional campaigns.
FMRI scans have shown convincing evidence that various factors influence how and why consumers accept certain brands and buy their products even at a higher price than the competition. Logic and rational thinking have little to do with it. Human beings are visceral beings and react to how certain stimulus makes them „feel“ (Vides, 2016).

Marketing and medical profession made a marriage in the early 1990s, and a new scientific discipline emerged: Neuromarketing. The first study of Neuromarketing began at Harvard University, yet its wider application started from the year 2002, imposing itself as an indispensable need and complement to the marketing research.

Neuromarketing connects neuroscience and marketing and can help keep consumers. In 2004, scientists from Princeton and Baylor investigated the neuroscience of two Coca-Cola and Pepsi beverages. The question arises: if these two drinks are chemically similar, will consumers prefer their favorite brand? When participants tried two wheels in a blind taste test, Pepsi's drinking enabled the centers of brain satisfaction. However, when researchers told participants who branded the dough, the centers for „judgment“ and „thinking“ in the brain were very active. It seemed that some participants decided to love Coca-Cola on the basis of their preferences. From this example we learn a little more about consumers, but also that their loyalty is very complex. It turns out that proving that someone who loves more brands is not the same as convincing someone to change loyalty. Therefore, before consumers accept the message it is very important to set the basis, which has great implications for leaders (Choy, 2018).

The task of neuromarketing is to understand consumer thinking through what is being studied to buy a particular product or service, rather than receiving answers from the buyer (which has traditionally been done by traditional marketing so far).

Neuromarketing uses several different techniques, and most often uses MRI (magnetic resonance imaging). The goal is to understand which part of the brain and how this part of the brain reacts to specific images, words and slogans. Based on the results, marketing campaigns are created, regardless of the product (promotion of cosmetics, food or campaign). It has been proven that the man most reacts to sound, photography and smell, and at least on words. That's why there are effective campaigns where we have very little text! In order to understand how neuromarketing works, one must first understand how the human brain works.

Today neuromarketing uses a lot of companies to discover techniques in how to bring their brand closer to the ultimate customer and these techniques are very effective. Thus, it has been proven that the placing of various products within TV shows has become obsolete marketing technique and has no impact on consumers, and that questionnaires are a thing of the past as they report subjective results. Today, the cigarette industry invests in the promotion of smoking harm, governments are investing in smokers' awareness of how much smoking is harmful, but 15 billion cigarettes are still sold every day. Why? We can find the answer in neuromarketing.

4.1. Advantages and disadvantages of neuromarketing

Analyzing the notion of neuromarketing, as well as ethical concepts of its application, clearly distinguish advantages and disadvantages. Unlike traditional marketing, the advantage of neuromarketing is innovation and the ability to obtain new information. Since the brain is not visible to the naked eye, neuromarketing allows him to find out more about it. Using his techniques, he can explore subconscious responses and watch brain activity in humans and their reaction to marketing tools that consumers are not aware of. In addition, neuromarketing can add value to consumers. Neuro-marketing information makes it easier to connect consumers with products or services. Given that consumers often give subjective responses to preferences and tastes, the advantage of neuromarketing is to give more objective measurements and results. It is known that emotions play an important role in making decisions, but it is often difficult to measure them. With neuromarketing techniques such as facial encoding, emotional reactions and emotions related to packaging, web site or color can be measured.

On the other hand, the primary drawback is the fact that it is difficult to generalize, or to make conclusions pertaining to every consumer. The reason is that relatively small samples (about 15 people) are often used for analysis with fMRI. The great lack of fMRI technique is that it does not give „live“ images. Researchers can not see how the brain responds to advertising or real-time photography. For researchers, the brain is still a big secret and they know nothing 100% safe, because different functions will always show overlapping with different brain areas.
With the development of neuromarketing, some of its disadvantages may disappear, and techniques will become more advanced but more accessible. It's already possible to buy glasses for eye tracking! Therefore, traders must keep in mind the needs of their consumers. Both traditional marketing and neuromarketing have their advantages and disadvantages (Odekerken, 2018). They tell us something about how consumers (or people in general) make decisions, were they aware or subconscious.

4.2. Ethics of neuromarketing

Linking products with a person who shows interest in this product is the main goal of marketing. This means that marketing shapes design and presentation in a specific way. As a result, products are more compatible with consumer preferences. Often the question arises as to whether the information is ethical, given by us neuromarketing.

These insights tell us something about processes that we are not aware of. That means we can not control them either. The questions that consumers will begin to ask are: „If dealers have access to this information, can they discover the“ shopping button „in my brain? Will they try to see sales growth?“ Finally, science and technology will reach the level at which they will play a major role in our lives. They already do it: Facebook violates our privacy by selling our information to other companies and Google. He knows where we are twenty-four hours in seven days. It is important that the marketer knows how to answer consumer questions. How can someone explain to someone that neuromarketing is ethical?

However, this is not about neuromarketing, but about what people - researchers, traders, politicians - work with information. The second argument is that marketing is an intermediary between a product and someone who already has an interest in this product. Nobody forces anyone to buy a particular product. Consumers have already sought or thought about buying this product.

4.2.1. Ethical codex

With all the excitement offered by, neuromarketing it still poses a certain threat. Consumers could begin to believe that knowledge of their brain violates their privacy. The reason people are experiencing neuromarketing as good or bad supports ethical and unethical cases. If a company that produces an unhealthy carbonated drink, it can use brain information only to increase sales to obese people - that's bad. There is no added value, they do not help others (they support unhealthy behaviors), and their goal is only profit.

If a company uses brain information to maximize a charity campaign, it is good because it helps others and adds value to society. It is very important to use the information provided by neuromarketing correctly. Therefore, different researchers look for a strict code of ethics. The primary goal is to protect vulnerable groups that could be endangered by neuromarketing. Stores that deal with smaller online businesses should make sure their consumers trust them. If mutual trust is not present, consumers might consider neuromarketing for a manipulative tool. For each company, a high level of trust and a low level of perceived risk are the key to success. In order to clarify the ethics code of neuromarketing, the following is an indication of a few examples of non-ethical and ethical cases of neuromarketing.

4.2.2. Non-ethical cases of neuromarketing

There is a great chance that neuromarketing will be used to create a campaign of politicians. Like products and they could be presented in the most favorable way to get more votes. During the 2004 US election, one study looked at brain activity and political judgment. The latest research focuses on the appearance of political candidates. If people see a lost candidate, they show greater activity in the insula (specific area of the brain associated with pain). The researchers concluded that negative attributes play a key role in the elections.Moreover, neuroimaging was done on the perception of human faces. The researchers studied facial symmetry, skin color and the attraction associated with brain activity. Although this research could now look innocent, it could still have a major impact on the future. What, if it happens, that important, corrupt politicians know which picture will lead to the highest number of votes? Or how to shape their speech that will affect the voters to win the elections? This is an example of where neuromarketing can lead to unethical consequences.

Another unethical practice of neuromarketing is that due to the use of fast food, sugar and processed food, a group of people with overweight is growing. A study in 2011 shows that the brain of obese people responds differently to food labels. When identical milkshakes are given, they show more brain activity in reward areas if the label is read as „regular“ in relation to „low fat“. This evidence shows that consumers will behave differently depending on the designation or design of the product. Will obesity people respond differently to color, image or touch? If traders get an insight

into these findings, they could design and offer their unhealthy products in such a way, and an endangered group of obese consumers will probably be ready to buy them.

4.2.3. Ethical cases of neuromarketing

Differences in messages on cigarette or tobacco packaging can be noticed in different countries of the world. In the Netherlands, horrible images of physical damage caused by smoking can be seen. In Australia, a personal story about a man named Bryan is described. Bryan died six weeks after he started smoking. Although there are great differences, the goal of all these messages is the same. They should inform smokers about the effects of smoking and giving up smoking. Such diversity in communication shows that there is no agreement on which message is most effective.
Cialdini describes that people often deny that they will encounter the dangers of smoking. However, when detailed information is provided on how to change their bad habit, people are facing their fears and taking measures. Knowing this, neuromarketing can add important insights into the brain to further enhance the campaign. Neuroscience has already been active in anti-smoking campaigns. In 2011, Berkman and his colleagues studied brain scanning to predict which message would most likely affect people to call the smoking stop line. They concluded that when considering brain activity, they could better predict the effects of smoking messages in relation to traditional research. This shows that people in polls often give answers that are not completely „true“, and so surveys are not reliable. On the other hand, neuromarketing can reveal these important information and thus complement the existing marketing tools.

Another ethical practice of neuromarketing is that it is used for charity purposes. Charity organizations often use television to broadcast charity ads that show sick and hungry children in Africa. The goal of such advertisers is to convince the donors to donate. However, does this mean that donors need to donate more? The Schlosser & Levy (2016) study shows that people are more willing to donate whenever they consider themselves better than someone else. This phenomenon is called a comparison down and is the most effective when a charity organization outlines the benefits of donations to others. This means that a commercial showing happy children who are able to go to school due to the donation will be more effective in collecting donations. Looking at the brain, neuroscientists have discovered that the striatum is activated while giving and experiencing a sense of reward. This means that donation or kindness towards others results in greater happiness for donors.

Neuromarketing is interesting for every dealer who wants to know how the brain of their consumers works. They would like to know more about the emotional aspect of their products and why consumers want or do not want to use their product or are simply curious about why people visit their webshop. In all these cases, neuromarketing could give them an answer. Large companies like Google, Walt Disney and XBOX (Microsoft) use neuromarketing to see how much their consumers are engaged. Of course, there are budget differences for each business.

Brain imaging is not the cheapest option, but there are other similar tools that can help. As the popularity of neuromarketing grows, so does the number of experts growing. In addition, new research on the brain of consumers is often published. The brain will be even better understood in the future. The brain is involved in everything we do and therefore plays a big role in every business. If companies want to sell more, they have to look to the future, because everything that is happening today is already considered as a past.

5. Implications and conclusion

In the end, what can be said about artificial intelligence and neuromarketing? With the development of artificial intelligence, there is a possibility that machines in some segments are increasingly changing people. The development of AI for people could open up new opportunities, such as new jobs. In that case, this could help people make a better contribution in their work. The use of artificial intelligence, data analysis, and data processing is becoming more and more efficient, as

marketers spend less time analyzing data, but therefore have more time to search for answers to questions about them. Modern computer-based infrastructures that support artificial intelligence and machine learning increasingly help traders to understand and anticipate human behavior. In this way, they are secured to create additional value for the consumer. Thanks to artificial intelligence, traders can learn a lot about consumer habits and preferences, and based on this, they can offer content according to their taste. In addition, the practice of visual listening slowly but surely develops in the marketing world. This means that smart apps can recognize visual content and analyze ads that attract audiences most.
Artificial intelligence can be used by marketers to improve data processing, mapping consumer ways, optimizing supply, and improving overall user experience. The expressed relationship between AI and marketing is manifested through the processing of large amounts of data on user behavior in a digital environment. Based on the results obtained, marketers can place relevant ads at the right time, in the right place and the right audience. Artificial Intelligence can design a website in a short period of time, which the company wants to present to the world at a very low cost.

Chatbots make it easy for marketing professionals to improve sales, save time and resources. These are pre-filled bots that respond to the most common questions that users are asking. They help visitors to get information without wasting time, and for smaller companies they are useful because they do not have to hire a living person to answer questions. Today consumers receive too much information and their attention is difficult to keep. In order to attract new consumers, chatbots are one of the best choices, so small and medium-sized businesses have to include chatbots in their purchase plan. In order to keep up with the rapid development of technology, large companies should use artificial intelligence.

Neuromarketing links marketing, neuroscience and psychology. This connection gives new, interesting insights into the mind of consumers. People use the brain for everything they do and therefore the brain plays a big role in every business. The success of neuromarketing is measured by increasing sales. The rapid growth of neuromarketing can be explained by the continuous advancement of technology, but also by the fact that traders are increasingly aware that the usual methods of research, such as focus groups and questionnaires, are not reliable when it comes to discovering the right motive that determines consumer behavior. Due to increasing competition and the emergence of innovations in the market and research of neuromarketing are increasingly used. Using neuromarketing techniques, subconscious consumer responses can be explored and watched their brain activity and reaction to marketing tools, even though consumers are unaware of it. Neuromarketing provides much more objective measurements and results.

In the free market, the satisfaction, wishes and needs of consumers are in the first place. Consumer is the boss! Under the pressure of consumers, large corporations are growing or falling. Based on their competitive ability to better meet the wishes and needs of consumers, they are increasingly competitive on the market. Neuromarketing provides a true competitive edge in crowded markets. Today, the „language of the brain“ is universal and opens the door to global norms, although people live in different countries with different cultures and speak different languages.

Traditional marketing and neuromarketing have their advantages and disadvantages. Neuromarketing is very important for traders. Neuromarketing research can be expensive, but everything can be expensive, which does not return the investment. The environment in which we live today is very exciting when it comes to technology development. Business people and traders should be open to accepting new ideas. Neuromarketing offers a competitive edge in the market, therefore if companies want to sell more, they must invest in neuromarketing. In the future, with the new development of neuromarketing, some of its shortcomings may disappear, and techniques will become more advanced but more accessible.

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Review paper / Pregledni rad

ERP SYSTEMS AND BUSINESS PERFORMANCE: A LITERATURE OVERVIEW

Abstract

The main objective of this paper is to provide an overview of relevant literature in the field of enterprise resource planning (ERP) systems and their correlation with business performance. The research questions are: Is there any correlation between the use of ERP systems and the improvement of business performance? How business performance correlate with the use of ERP systems?

For the research, 47 scientific papers, from the field of ERP systems and their correlation with business performance, were analysed. Analysed papers were published in the period from 2002 to 2018. The results of the literature research show that the use of ERP systems in business processes does not guarantee their positive impact on business performance. Also, it is not enough just to consider the success of the ERP project implementation and to relate it to the performance of the enterprises. Actually, the continuous use of the ERP systems primarily contribute to the performance, and that type of contribution can be evaluated only through the perspective of the end users of ERP systems. The analysis shows that there is a lack of research that investigates the correlation between ERP systems and business performance from an end users perspective, as well as a comparison of this correlation between different companies; so further research should be more focused to this topic.

Keywords:*ERP systems, business performance, financial performance, end-user perspective.*

1. Introduction

For more than three decades, enterprise resource planning (ERP) systems have been implemented in different organizations, in order to support core business processes, such as production, supply and distribution, inventory management, sales and marketing, finance and accounting, human resources, and quality management (Romney & Steinbart, 2012). ERP systems are now "widely accepted by organizations and have become the backbone of IT business management" (Mangin et al., 2015). Moreover, the level of investment in the implementation of ERP systems is most often considered at a strategic level, because it could be an investment in hundreds of thousands or millions of dollars (Poston & Grabski, 2001, Falk, 2005, Liu et al., 2008).

ERP system is a business management system that comprises integrated sets of comprehensive software, which can be used to manage and integrate all the business functions within an organisation, with a rationalised data architecture, characterised by core process integration and shared product and/or customer databases (Ross et al., 2006). Among the most important attributes of ERP system are its ability: to automate and integrate business processes, to enable the implementation of best business practices, to share common data and practices across the entire enterprise, to create and access to information in real time (Soh et al., 2000; Nah & Lau, 2001).

ERP system implementation is often associated with business process re-engineering (Koch, 2001; Subramoniam, 2008). During the 1990s ERP systems became the de-facto standard for the replacement of legacy systems in large companies, particularly multinational (Shanks, 2000).

ERP systems are designed in a way that should enable the improvement in enterprise productivity, upgrade the organization's ability to create timely and accurate information across the enterprise and its supply chain.

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Successful implementation of ERP systems can reduce the product development cycle, reduce inventory levels, improve customer service, and improve coordination of global operations. Implementation of the ERP system, if done properly, should increase the productivity ratio (efficiency, input/output), improve the company's profitability and its effectiveness through better customer relationships (Irfan, 2016).

The subject of the research presented in this paper is the theoretical analysis of ERP systems in companies and the correlation with the performance of these companies.
The main objective of the research is to provide an overview of relevant literature in the field of ERP systems and their correlation with business performance. Research questions are:

1. Is there any correlation between the use of ERP systems and the improvement of business performance?
2. How business performance correlate with the use of ERP systems?

2. Methodology

In order to find answers to defined research questions, a literature review approach is used. However, the first step in a literature review was a collection of relevant literature, so Ebsco and Scopus databases were browsed. Combination of keywords used in the search was *"ERP system and business performance"*.

The literature search of papers published from 2002 to 2017 was carried out in February 2018. An additional search was done in January 2019, in order to reach the papers published in 2018. The result was 68 papers, from which 44 were identified in Ebsco database and 24 in Scopus.

3. Results and discussion

Since the objective of the presented research is to analyse the current state of research on the relation between ERP systems and business performance of enterprises, the following criteria are used for analysis and paper classification:
- Time period, i.e., year of publication (2002-2018),
- Papers study the relationship between ERP systems and business performance.

With respect to the defined criteria, 47 relevant papers were chosen. These papers analyse the relation between ERP system and business performance of enterprise and they were published in the period from 2002 to 2018. In Table 1, the papers classification is based on the business performance dimension that is researched as a relationship with the ERP system. The assumption is that there is a relationship between the ERP systems and all dimensions of business performance (see Table 1).

Table 1 Business performance dimensions that papers are studying

Business performance dimensions related to the ERP systems	**Number of papers that 76ttack76 them**	**Authors and years of publication**
financial performance	10	Bavarsad et al. (2013.) Gupta et al. (2018) Hendricks et al. (2007) Johansson et al. (2016) Lianto et al. (2015) Nicolaou and Bajor (2011) Patalas-Maliszewska and Kreb (2014) Rajnoh et al. (2017) Shiau et al. (2004) Wieder et al. (2006)
financial performance and supply chain	1	Ince et al. (2013)

Business performance dimensions related to the ERP systems	Number of papers that 76ttack76 them	Authors and years of publication
financial performance and decision making	1	Hou (2013)
financial performance and organizational knowledge	1	Elmonem et al. (2016)
financial performance and business processes	1	Tsai et al. (2011)
financial and operational performance	1	Zhang et al. (2012.)
financial performance, operational performance and decision-making	2	Albu et al. (2015) De Alwis and Dissanayake (2009)
financial performance, organizational knowledge and decision-making	1	Mukulu and Karimi (2010)
financial performance, business processes and innovations	1	Euripidis and Fotini (2015)
financial performance, strategy and organizational performance	1	Hassabelnaby et al. (2011)
financial performance, management and competitiveness	1	Mjomba and Kavale (2015)
financial, operational and sales performance	2	Hart and Snaddon (2014) Nawaz and Channakeshavalu (2013)
integration of the organization	1	Jirava (2017)
competitive advantages	1	Handoko et al. (2015)
supply chain	4	Bac and Erkan (2013) Hwang and Min (2013) Qazi Abro et al. (2017) Shatat and Udin (2012)
decision making	1	Lečić and Kupusinac (2013)
operational and managerial performance	1	Almgren and Bach (2014)
operational performance	6	Ağaoğlu et al. (2015) Antoniadis et al. (2015) Chen et al. (2007) Laframboise (2002) Madanhire and Mbohwa (2016) Tenhiälä and Pekka Helkiö (2015)
operational, management and strategic performance	1	Wibowo and Sari (2018)
organizational structure and management	1	Shoeby and Rehman (2018)
organizational knowledge, processes and integration of the organization	1	Gattiker and Goodhue (2005)
business processes	2	Lee et al. (2009) Stefanović et al. (2011)
business processes and organizational knowledge	1	Elragal and Al-Serafi (2011)
production performance	1	Alasakri et al. (2013)
strategy and employee performance	1	Ibrahim et al. (2008)
management	1	Chtioui (2009)
customer satisfaction	1	Tsai and Lin (2007)

Source: Authors

As a source of information, analysed papers use either literature review, or empirical research or case study. Table 2 shows the classification of these papers concerning the source of information used in a particular paper.

Table 2 Sources of information used in the papers

Source of information	Authors and years of publication
case study	Ağaoğlu et al. (2015)
	Albu et al. (2015)
	Chtioui (2009)
	Elragal and Al-Serafi (2011)
	Ibrahim et al. (2008)
	Jirava (2017)
	Madanhire and Mbohwa (2016)
	Mjomba and Kavale (2015)
	Mukulu and Karimi (2010)
empirical research	Alasakri et al. (2013)
	Antoniadis et al. (2015)
	Bac and Erkan (2013)
	Bavarsad et al. (2013.)
	Chen et al. (2007)
	De Alwis and Dissanayake (2009)
	Euripidis and Fotini (2015)
	Gattiker and Goodhue (2005)
	Gupta et al. (2018)
	Handoko et al. (2015)
	Hart and Snaddon (2014)
	Hassabelnaby et al. (2011)
	Hendricks et al. (2007)
	Hou (2013)
	Hwang and Min (2013)
	Ince et al. (2013)
	Johansson et al. (2016)
	Laframboise (2002)
	Lianto et al. (2015)
	Nicolaou and Bajor (2011)
	Patalas-Maliszewska and Kreb (2014)
	Qazi Abro et al. (2017)
	Rajnoh et al. (2017)
	Shatat and Udin (2012)
	Shiau et al. (2004)
	Shoeby and Rehman (2018)
	Stefanović et al. (2011)
	Tenhiälä and Pekka Helkiö (2015)
	Tsai and Lin (2007)
	Tsaiet et al. (2011)
	Wibowo and Sari (2018)
	Wieder et al. (2006)
	Zhang et al. (2012.)

Source of information	Authors and years of publication
literature review	Almgren and Bach (2014)
	Elmonem et al. (2016)
	Lečić and Kupusinac (2013)
	Leet et al. (2009)
	Nawaz and Channakeshavalu (2013)

Source: Authors

Table 1 shows that most of the papers analyse the financial performance of the enterprises, either by analysing exclusively financial performance or financial performance in combination with another type of enterprise performance. Precisely, 23 out of 47 analysed papers deal with the relationship between the ERP systems and the financial performance of (Table 3).

Table 3 Number of papers that analyse financial performance

Financial performance related to the ERP systems	Number of papers
financial performance	10
financial performance and supply chain	1
financial performance and decision making	1
financial performance and organizational knowledge	1
financial performance and business processes	1
financial performance, operational performance and decision-making	2
financial performance, organizational knowledge, and decision-making	1
financial performance, business processes and innovations	1
financial performance, strategy and organizational performance	1
financial performance, management and competitiveness	1
financial and operational performance	1
financial, operational and sales performance	2
TOTAL	**23**

Source: Authors

One of the reasons for focusing on financial performance analysis is the comprehensiveness of financial performance indicators in business results presentation, as well as the ability to compare different companies through financial indicators. Papers, with the topic of the ERP system's impact on the company's financial performance, analyse different financial performance indicators, as it can be seen in Table 4.

Table 4 Financial performance indicators related to the use of ERP systems

Financial indicators related to the use of ERP systems	Authors and years of publication
net income, net profit, total assets, total liabilities	Lianto et al. (2015)
sales growth and growth of profit margins	Tsaiet al. (2011)
Revenue	Euripidis and Fotini (2015)
Profit	Mukulu and Karimi (2010)
the growth of revenue and cost reduction	Hou (2013)
ROA[3]	Hassabelnaby et al. (2011)
ROA, ROE[4]	Bavarsad et al. (2013.)
ROE	Rajnoh et al. (2017)

[3] ROA – return on asset
[4] ROE – return on equity

ROI[5]	Johansson et al. (2016)
ROI, EBIT[6], sales growth, cost reduction, and cash-flow	Wieder et al. (2006)
ROI, revenue, profit	Gupta et al. (2018)
ROI, ROA, ROS[7]	Hendricks et al. (2007)
ROI, ROS	Ince et al. (2013)
ROS	Patalas-Maliszewska and Kreb (2014)
ROS, ROA	Nicolaou and Bajor (2011)
cost reduction	De Alwis and Dissanayake (2009)
	Elmonem et al. (2016)
	Zhang et al. (2012.)
cost reduction, inventory turnover	Shiau et al. (2004)
cost reduction, the growth of revenue, inventory level reduction	Hart and Snaddon (2014)
cost reduction, profit growth	Mjomba and Kavale (2015)
cost reduction, the growth of sales and revenue	Nawaz and Channakeshavalu (2013)
the growth of sales and profit	Albu et al. (2015)

Source: Authors

Hence, the most common area of ERP systems impact is cost reduction, an increase of revenue and increase of profits, where profit growth is expressed by increased profit margins, operating profit, ROS, ROI, ROA or ROE.

In the analysed papers, the contribution of the ERP system to enterprise performance is explored from different points of view. Some authors seek to find the indicators that will objectively measure the impact of the ERP system on business performance, so they measure performance before and after ERP system implementation in the enterprise. Others compare performance in the companies that use and companies that do not use ERP systems. Moreover, some authors compare enterprise performance depending on the number of years of use of ERP systems, as well as the impact of financial investment in the ERP system on the financial performance of the enterprise.

The other authors are aware of the fact that just having an ERP system, or even using an ERP system in business processes, does not guarantee success or a positive impact of the ERP system on business performance. These authors attempt to evaluate either the success of ERP systems implementation or different dimensions of ERP systems. Common to these papers is the fact the ERP systems are quantified from theend users point of view, and in most of the papers, Likert's five-stage scale was used.
The analysed papers differ concerning ERP systems dimensions they evaluated. Namely, the success of implementation of ERP systems is evaluated by different factors, such as financial resources, training and education, top management support, and organizational culture (Alasakri et al., 2013). The other authors measure the success of implementation through technological factors, organizational factors and environmental factors (Qazi Abro et al., 2017), or through integration, configuration, system customization and user training (Hwang and Min, 2013). Hassabelnaby et al. (2011) success of implementation measure by assessing the level at which the company has implemented the full capacity of the ERP system from the end user point of view.

But all these papers deal with the success of the implementation, considering the success of the implementation project itself, and link it to the different business performance and do not take into consideration the post-implementation period, i.e., how the continued use of the ERP systems contributes to the performance.

[5] ROI – return on investment
[6] EBIT – earnings before interest and tax
[7] ROS- return on sale

The papers that are classified into the category *"evaluation of ERP systems dimensions from the end user perspective"* evaluate how the ERP system is used in business. Common to these papers is that they examine end users' opinions about ERP systems characteristics, ways of using or benefits of ERP systems, during their continuous use, not just during the implementation process, which ends when the ERP system is put into operation. The various dimensions of the ERP systems were analysed. Some researches required from users to evaluate the level of ERP system development in the enterprise (Euripidis and Fotini, 2015), the level of business process standardization derived from the ERP system (Chtioui, 2009), soft and hard characteristics of ERP system, quality of system and information maintenance (Tsai et al., 2011), or quality of implementation services (Tsai and Lin, 2007).

Hart and Snaddon in their work measure ERP system through the expected benefits of the ERP system from the end user's point of view, using the balanced scorecard (BSC), comparing financial and other performance, over three years after ERP system implementation (Hart and Snaddon, 2014). Chen et al. also used the BSC, but they measured different variables - financial and non-financial performance of the enterprise. They introduced the concept of *"ERP knowledge management"*, as the knowledge that company possesses as a result of ERP system use and manage this knowledge through the ERP system while end users in companies evaluate a number of factors that define this concept (Chen et al., 2007).

Other papers in this group use the dimensions from *"DeLone & McLean's information system success model"* (DeLone and McLean, 2003) to evaluate the ERP systems dimensions. The presentation of the papers and their authors regarding the way the ERP system was analysedis shown in table 5.

DeLone and McLean (2003) state that the success of the information system should be focusedon the specific benefits resulting from the information system (IS) project. They provide the basis for measuring the success of information systems with their *"D&M IS Success Model"* from 1992. After the appearance of the *„D&M IS Success Model",* other researchers worked on adaptation and extension of this model expanded, as well as on its empirical research. Taking into account new research, DeLone and McLean in 2003 released a new *"DeLone & McLean's information system success model"*. Their model has been widely accepted in the academic literature as a powerful and effective representation of the factors combined to create the success of Information Systems (Stefanović et al., 2011). Researchers have shown great interest in this model, and according to Petter's research, the model was quoted in more than 300 scientific papers that tried to explain the success of the information system (Petter et al., 2008). The advantage of this model is that it provides a scheme for categorizing the multitude of IS success measures which have been used in the research literature. Moreover, the model shows the interdependencies between the categories (Stefanović et al., 2011).

DeLone and McLean point out that their model does not develop measures, nor it interprets results. The model helps researchers to put data into the framework in order to make it easier to understand and explain data (DeLone and McLean, 2003).

Table 5 ERP System Analysis Methods

ERP System Analysis Methods	Number of papers	Authors and years of publication
investment in ERP implementation	1	Nawaz and Channakeshavalu (2013)
evaluation of ERP systems dimensions from the end user's perspective	15	Bavarsad et al. (2013.)
		Chen et al. (2007)
		Chtioui (2009)
		De Alwis and Dissanayake (2009)
		Euripidis and Fotini (2015)

ERP System Analysis Methods	Number of papers	Authors and years of publication
		Handoko et al. (2015)
		Johansson et al. (2016)
		Shatat and Udin (2012)
		Shiau et al. (2004)
		Stefanović et al. (2011)
		Tsai and Lin (2007)
		Tsaiet et al. (2011)
		Wibowo and Sari (2018) Hart and Snaddon (2014)
the success of an implementation from the researcher's perspective	2	Albu et al. (2015)
		Ibrahim et al. (2008)
the success of an implementation from the end-users perspective	8	Ağaoğlu et al. (2015)
		Alasakri et al. (2013)
		Almgren and Bach (2014)
		Antoniadis et al. (2015)
		Hassabelnaby et al. (2011)
		Hwang and Min (2013)
		Qazi Abro et al. (2017) Gupta et al. (2018)
comparison of performance before and after ERP	6	Jirava (2017)
		Leet et al. (2009)
		Lianto et al. (2015)
		Madanhire and Mbohwa (2016)
		Nicolaou and Bajor (2011) Patalas-Maliszewska and Kreb (2014)
comparison of performance before and after ERP from the end-users perspective	3	Gattiker and Goodhue (2005)
		Mjomba and Kavale (2015)
		Mukulu and Karimi (2010)
comparison of performance concerning the number of years from the ERP implementation	2	Hendricks et al. (2007)
		Zhang et al. (2012.)
comparison of the performance of companies that use and companies that do not use ERP	7	Bac and Erkan (2013)
		Elmonem et al. (2016)
		Hou (2013)
		Laframboise (2002)
		Lečić and Kupusinac (2013)
		Rajnoh et al. (2017)
		Wieder et al. (2006)
comparison of the performance of companies that use and companies that do not use ERP from an end-user perspective	1	Ince et al. (2013)

ERP System Analysis Methods	Number of papers	Authors and years of publication
evaluation of the use of ERP from the end user's perspective	2	Elragal and Al-Serafi (2011)
		Tenhiälä and Pekka Helkiö (2015) Shoeby and Rehman (2018)

Source: Authors

4. Conclusion

Research in the 83ttack83a papers shows that the use of ERP systems in business processes does not guarantee their positive impact on business performance. Also, it is not enough to consider the success of the ERP project implementation and to relate it to the performance of the enterprise. The continuous use of the ERP system contribute to the performance, but that type of contribution can be evaluated only through the perspective of the end users of the ERP system.

The analysis shows that there is a lack of papers that investigate the correlation between ERP systems and business performance. Especially, there is a lack of research which investigates this correlation from the end-users perspective, as well as a comparison of this correlation between different companies. Further research should be more focused on empirical research of correlation between ERP systems from the end-users perspective and objective business performance.

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AUTOMATING WEB APPLICATION TESTING USING KATALON STUDIO

Abstract

Software testing is often a neglected part of the software development lifecycle. This is especially true in developing countries where software development is still a relatively new industry. Managers underestimate the importance of testing and the impact of bugged software releases. This paper will show how Katalon Studio could be used to automate testing of web applications in order to detect any issues prior to software release and in conclusion explain the potential dangers if no testing is done prior to software release.

Keywords:*Unit testing, Katalon Studio, web application, performance, bugs*

1. Introduction

Testing and documentation of software are often neglected parts of software development. As a result, end-users find it difficult to use a 87ttack87ationa application with many modules and, if testing is neglected, once the application is released it could show unexpected behavior caused by bugs in the code that could have been detected earlier if testing was performed properly. Downtime in any business equals loss in profit so testing is important and should be addressed as a crucial part of software development.

2. Problem being addressed

Clients are able to lodge an online loan request on the official web site or using Viber on their phones or on Facebook. These online loan requests are then sent as an automated email to the corresponding branch manager. The branch manager is selected based on branch jurisdiction over the client's municipality (every municipality is designated one branch). Based on the client's municipality, the branch manager forwards the email to the loan officer who works in the municipality or, if there is more than one loan officer, the one who is next in line to process an online loan request. The loan officer processes the online loan request and either creates a real loan application or rejects the online request recording the reason why the online request was rejected.

The problem with this system is that there is no central record keeping of these online loan requests. To discover the outcome, Marketing sends an Excel file to branch managers. This file lists all online requests for the reporting period. Then the branch manager forwards the file to loan officers asking them to fill in the details about their online requests (outcome, reason etc.). Once the loan officers complete the file, it is returned to the branch manager, who then sends the answers back to Marketing.

This procedure is unnecessarily complicated and time consuming. Hence a new web application was created where the branch manager receives the email, enters client details and assigns the online request to a loan officer. The loan officer records all activities related to the online request and all communication with the client in the appropriate fields in the web application. That way, users can easily and at any time access all data and analyse it. There is even an export option allowing easier data processing.

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3. Software requirements

The web application was required to be simple to use (user-friendly with low learning time) and, since it would be used on an intranet, security was inherited from the domain so all authentication and authorization is linked to the domain user account.

Each loan officer can see only those onlinerequests that are assigned to him.Each branch manager sees only online requests from that particular branch.Marketing users and administrators see all online requests.Only branch managers may enter new online requests and assign them to loan officers from their branch.Once the branch manager assigns the online request, an email is sent to that loan officer notifying him about the new online request.

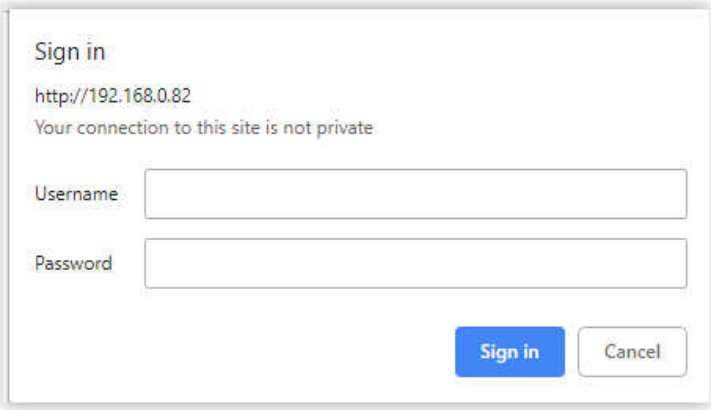
The loan officer records all activities and communication with the client in the appropriate fields and after that the processing is complete.Authorized users can access online requests in the web application and, by checking their status, easily identify the reasons why a particular online request was rejected as well as identify those online requests that are still being processed.

4. Software implementation

The application was implemented using C# targeting .NET framework 4.5.1. A dedicated SQL database is used to store all the data pertaining to online requests.

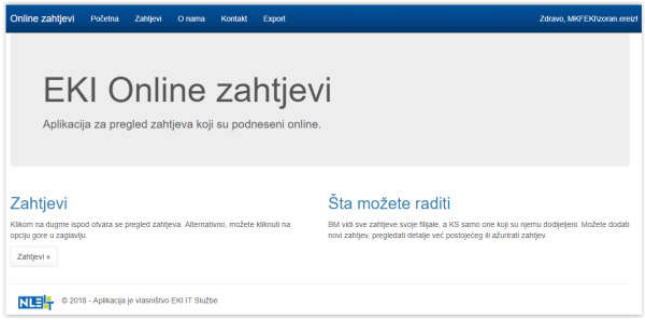
If the user is not logged in, the application provides the usual login form (Fig. 1).

Figure 1 Login screen (Ereiz, 2018)



Once successfully logged in, the user, depending on authorization, is taken to the welcome page (Fig. 2). Every user has different authorizations, depending on the role. The branch manager and administrators have the most privileges and can see all online requests while the loan officers can only see online requests assigned to them.

Figure 2 Welcome page for administrators and branch managers (Ereiz, 2018)



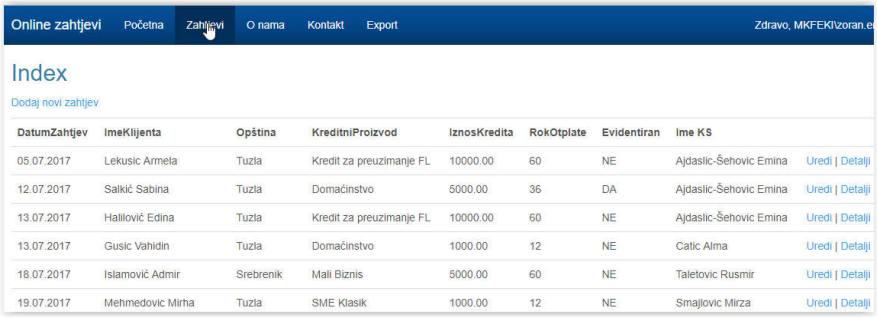
The user can access the Requests page in two ways:

- Menu item Zahtjevi (Requests) at the top of the page;
- Button Zahtjevi (Requests).

All the work is done on the Requests (Zahtjevi) page (Fig. 3).

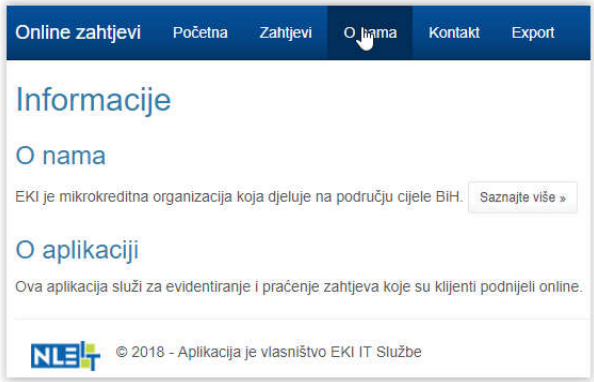
This is where the branch manager adds new online requests (using the *Dodaj novi zahtjev* link).

Figure 3 Requests page (Ereiz, 2018.)



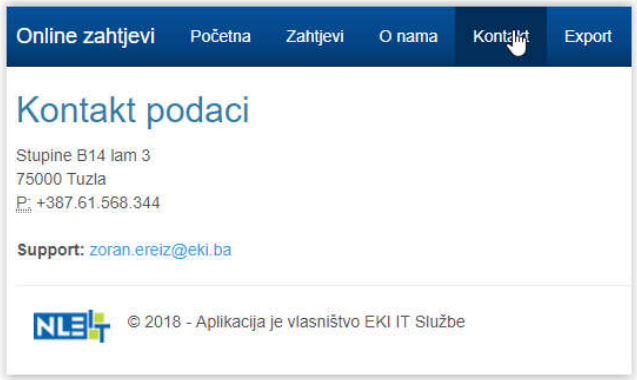
The application has the About Us page (Fig. 4) with details about the application owner (the button is a link to the company web site) and the application itself.

Figure 4 About Us page (Ereiz, 2018.)



A Contact page (Fig. 5) provides contact details (mailing/physical address and support email).

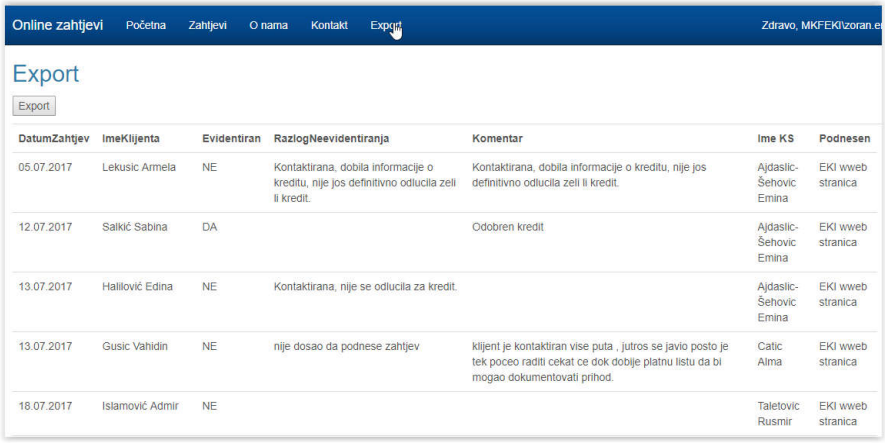
Figure 5 Contact details page (Ereiz, 2018.)



The Export menu option opens the Export page (Fig. 6) with a listing of online request displayed in a format acceptable to Marketing for further processing. This format has fewer columns than the format on the Requests (Zahtjevi) page.

There is an Export button used to export the displayed data to Excel.

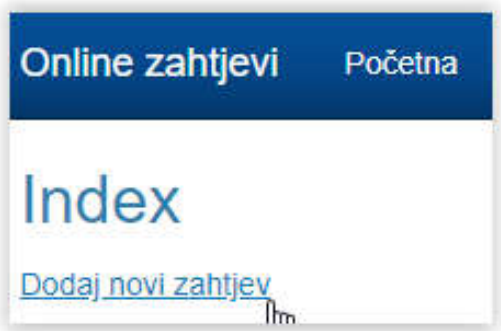
Figure 6 Export page



DatumZahtjev	ImeKlijenta	Evidentiran	RazlogNeevidentiranja	Komentar	Ime KS	Podnesen
05.07.2017	Lekusic Armela	NE	Kontaktirana, dobila informacije o kreditu, nije jos definitivno odlucila zeli li kredit.	Kontaktirana, dobila informacije o kreditu, nije jos definitivno odlucila zeli li kredit.	Ajdaslic-Šehovic Emina	EKI wweb stranica
12.07.2017	Salkić Sabina	DA		Odobren kredit	Ajdaslic-Šehovic Emina	EKI wweb stranica
13.07.2017	Halilović Edina	NE	Kontaktirana, nije se odlucila za kredit.		Ajdaslic-Šehovic Emina	EKI wweb stranica
13.07.2017	Gusic Vahidin	NE	nije dosao da podnese zahtjev	klijent je kontaktiran vise puta , jutros se javio posto je tek poceo raditi cekat ce dok dobije platnu listu da bi mogao dokumentovati prihod.	Catic Alma	EKI wweb stranica
18.07.2017	Islamović Admir	NE			Taletovic Rusmir	EKI wweb stranica

The branch manager adds a new online request using the *Dodaj novi zahtjev* link on the Requests page (Fig. 7).

Figure 7 Adding a new online request (Ereiz, 2018.)

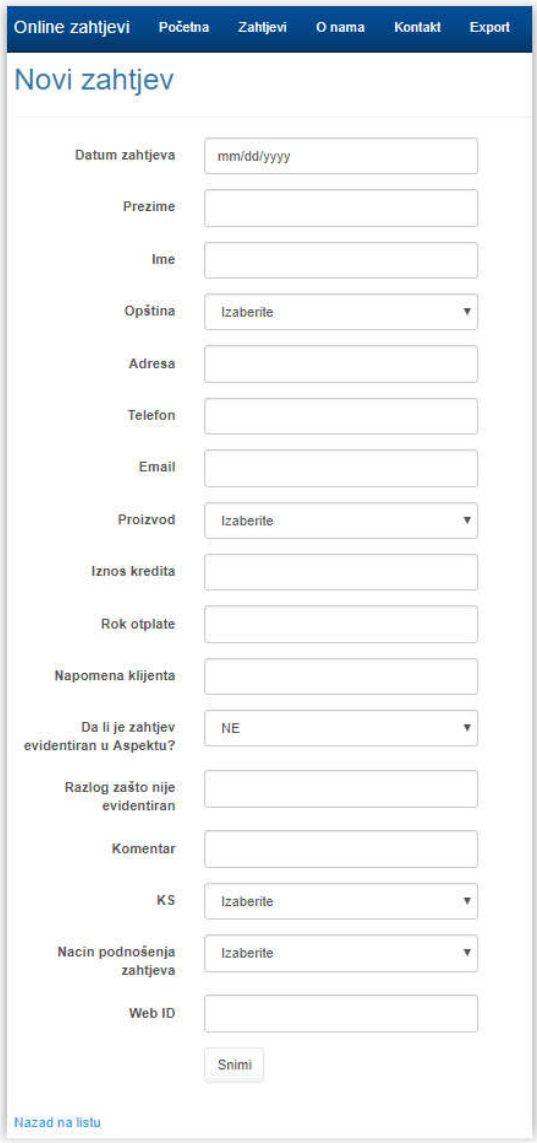


Once the branch manager clicks on this link a new page opens with a form (Fig. 8).

The branch manager enters all the information the clients have provided in appropriate fields. Some of the fields are lists, other are free text. Some fields are mandatory (if not selected/entered the application warns the branch manager on saving – klicking the *Snimi* button).

At the bottom of the page is the back to previous page link (*Nazad na listu*).

Figure 8 New request entry form (Ereiz, 2018.)



After recording the entry, a new record is saved to the database, it is immediately displayed on the Requests page and an email is sent to the assigned loan officer informing the officer of the online request (Fig. 9).

The email has a link in the body (*ovdje*) that takes the loan officer directly to that particular online request where the officer can find details needed to contact the client and enter additional information if necessary.

The email also contains specific instructions to the loan officer what needs to be done (Translated: Please contact the client and enter the result of the communication in the web application).

Figure 9 Email content (Ereiz, 2018.)

5. Components being tested

Based on the above description of the web application, the components being tested are:

- Security – who can log in
- Authorization – After logging in what the user can see and do
- Functionalities – entering data, saving, exporting etc.

6. Testing procedure

A. Testing Tools

The purpose of testing is to run the application through a series of real-life situation and to confirm responses are as expected i.e. every possible actions has been anticipated and covered appropriately. In layman words the purpose of testing is to confirm the application works properly and for a given set of input data it returns an expected output.

Software testing is as much an art as a science. In large, complex application, such as operating systems, it is practically impossible to iron out every single bug before releasing it both from the difficulty and time constraint points of view [1].

Katalon Studio was chosen as the testing tool for its variety of capabilities as well as for the price (free i.e. open-source). Katalon Studio has a friendly UI for users to quickly create, execute and maintain tests. Deployment is simple as everything is within one single package. All functionality ready for Web, API and Mobile (Android & iOS) automation with team collaboration and test management [2].

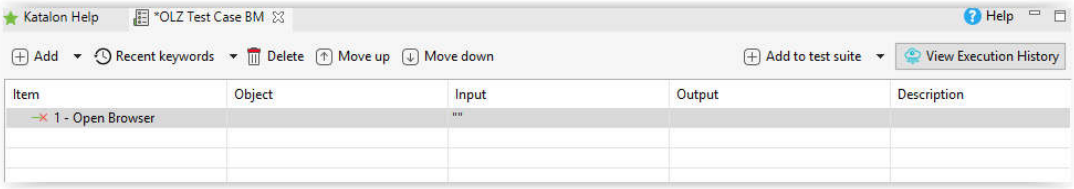
Katalon Studio has three main ways to creates tests:

- Record and Replay,
- Manual mode
- Script mode.

As the name hints, in record/replay mode the user records actions that have to be performed in the application (functionalities being tested) and, after saving the test, runs (replays) the test when needed. Additionally, the user can add a data file with various information and Katalon Studio uses this data file when running tests. The main benefits of this mode are: quick and easy recording of test cases, captures actions and objects, easy update/edit of the recorded steps and steps can be replayed on any available browser.

In Manual mode users can manually enter actions and keywords in test cases (Fig. 10).

Figure 10 Entering actions and kewords in Manual mode (Printscreen from Katalon Studio)



Some of the main features of Manual mode are: add keywords and actions stepwise, can refer captured objects, can drag and drop keywords directly and can replay on any available browser.

Scripting mode allows the user to write java code (i.e. programme) a test or, more often, to customize a recoreded test. Main features of Scripting mode are: test creation through scripting, can use java or groovy programming languages, can drag and drop objects directly and can replay on any available browser.

All three modes can be mixed and a test case can start with recording, followed with changes done in manual mode and finishing with customized actions prepared in script mode.

B. Tests

Two sets of application funcionality tests will be performed.

- Entering a new online application by the branch manager and assigning it to a loan officer as well as other activities a branch manager can perform.
- Activities a loan afficer is required to perform in the applcation.

Steps required for this test are:

- Open Katalon Studio and create a new project.
- Create two test cases for the branch manager and for loan officer activities.
- Create objects for each test case.
- Create (record, manually or script) tests.
- Create data files.
- Run tests.

C. Test Code for Branch Manager

```
importstatic com.kms.katalon.core.checkpoint.CheckpointFactory.findCheckpoint
importstatic com.kms.katalon.core.testcase.TestCaseFactory.findTestCase
importstatic com.kms.katalon.core.testdata.TestDataFactory.findTestData
importstatic com.kms.katalon.core.testobject.ObjectRepository.findTestObject
import com.kms.katalon.core.checkpoint.Checkpoint as Checkpoint
import com.kms.katalon.core.cucumber.keyword.CucumberBuiltinKeywords as CucumberKW
import com.kms.katalon.core.mobile.keyword.MobileBuiltInKeywords as Mobile
import com.kms.katalon.core.model.FailureHandling as FailureHandling
import com.kms.katalon.core.testcase.TestCase as TestCase
import com.kms.katalon.core.testdata.TestData as TestData
import com.kms.katalon.core.testobject.TestObject as TestObject
import com.kms.katalon.core.webservice.keyword.WSBuiltInKeywords as WS
import com.kms.katalon.core.webui.keyword.WebUiBuiltInKeywords as WebUI
```

```
import internal.GlobalVariable as GlobalVariable

WebUI.openBrowser('')

WebUI.navigateToUrl('http://localhost:55727/')

WebUI.click(findTestObject('Object Repository/BM/Page_Home Page - Online zahtjevi/a_Online zahtjevi'))

WebUI.click(findTestObject('Object Repository/BM/Page_Home Page - Online zahtjevi/a_Poetna'))

WebUI.click(findTestObject('Object Repository/BM/Page_Home Page - Online zahtjevi/a_O nama'))

WebUI.click(findTestObject('Object Repository/BM/Page_Informacije - Online zahtjevi/a_Saznajte vie'))

WebUI.click(findTestObject('Object Repository/BM/Page_Informacije - Online zahtjevi/a_Kontakt'))

WebUI.click(findTestObject('Object Repository/BM/Page_Kontakt podaci - Online zahtje/abbr_P'))

WebUI.click(findTestObject('Object Repository/BM/Page_Kontakt podaci - Online zahtje/a_zoran.ereizeki.ba'))

WebUI.click(findTestObject('Object Repository/BM/Page_Kontakt podaci - Online zahtje/a_Poetna'))

WebUI.click(findTestObject('Object Repository/BM/Page_Home Page - Online zahtjevi/a_Zahtjevi'))

WebUI.click(findTestObject('Object Repository/BM/Page_Pregled zahtjeva - Online zaht/a_Online zahtjevi'))

WebUI.click(findTestObject('Object Repository/BM/Page_Home Page - Online zahtjevi/a_Zahtjevi (1)'))

WebUI.click(findTestObject('Object Repository/BM/Page_Pregled zahtjeva - Online zaht/a_Dodaj novi zahtjev'))

WebUI.setText(findTestObject('Object Repository/BM/Page_Novi zahtjev - Online zahtjevi/input_Prezime_Prezime'), 'Marković')

WebUI.setText(findTestObject('Object Repository/BM/Page_Novi zahtjev - Online zahtjevi/input_Ime_Ime'), 'Marko')

WebUI.selectOptionByValue(findTestObject('Object Repository/BM/Page_Novi zahtjev - Online zahtjevi/select_IzaberiteBanja LukaBano'),

'122', true)

WebUI.setText(findTestObject('Object Repository/BM/Page_Novi zahtjev - Online zahtjevi/input_Adresa_Adresa'), 'Stupine B14')

WebUI.setText(findTestObject('Object Repository/BM/Page_Novi zahtjev - Online zahtjevi/input_Telefon_Telefon'), '035 333 222')

WebUI.setText(findTestObject('Object Repository/BM/Page_Novi zahtjev - Online zahtjevi/input_Email_Email'), 'test@sample.com')

WebUI.selectOptionByValue(findTestObject('Object Repository/BM/Page_Novi zahtjev - Online zahtjevi/select_IzaberitePoljoprivredaM'),

'4', true)
```

```
WebUI.setText(findTestObject('Object Repository/BM/Page_Novi zahtjev - Online
zahtjevi/input_Iznos kredita_IznosKredi'),

'2000')

WebUI.setText(findTestObject('Object Repository/BM/Page_Novi zahtjev - Online
zahtjevi/input_Rok otplate_RokOtplate'), '12')

WebUI.selectOptionByValue(findTestObject('Object Repository/BM/Page_Novi zahtjev - Online
zahtjevi/select_Izaberiteati AlmaSmajlo'),

'7', true)

WebUI.selectOptionByValue(findTestObject('Object Repository/BM/Page_Novi zahtjev - Online
zahtjevi/select_IzaberiteEKI web strani'),

'1', true)

WebUI.setText(findTestObject('Object Repository/BM/Page_Novi zahtjev - Online
zahtjevi/input_Web ID_WebID'), '222')

WebUI.click(findTestObject('Object Repository/BM/Page_Novi zahtjev - Online
zahtjevi/input_Web ID_btn btn-default'))

WebUI.click(findTestObject('Object Repository/BM/Page_Pregled zahtjeva - Online
zaht/a_Detalji'))

WebUI.click(findTestObject('Object Repository/BM/Page_Detalji - Online zahtjevi/a_Nazad na
listu'))

WebUI.click(findTestObject('Object Repository/BM/Page_Pregled zahtjeva - Online zaht/a_Uredi'))

WebUI.click(findTestObject('Object Repository/BM/Page_Ureivanje - Online zahtjevi/a_Nazad na
listu'))

WebUI.click(findTestObject('Object Repository/BM/Page_Pregled zahtjeva - Online
zaht/a_Detalji'))

WebUI.click(findTestObject('Object Repository/BM/Page_Detalji - Online zahtjevi/a_Uredi'))

WebUI.selectOptionByValue(findTestObject('Object Repository/BM/Page_Ureivanje - Online
zahtjevi/select_NEDA'), '2', true)

WebUI.setText(findTestObject('Object Repository/BM/Page_Ureivanje - Online
zahtjevi/input_Komentar_Komentar'), 'Posjeta bila danas, 07.01.2019. godine')

WebUI.click(findTestObject('Object Repository/BM/Page_Ureivanje - Online zahtjevi/input_Web
ID_btn btn-default'))

WebUI.click(findTestObject('Object Repository/BM/Page_Ureivanje - Online zahtjevi/a_Online
zahtjevi'))

    WebUI.closeBrowser()
```

D. Test Code for Loan Officer

```
importstatic com.kms.katalon.core.checkpoint.CheckpointFactory.findCheckpoint

importstatic com.kms.katalon.core.testcase.TestCaseFactory.findTestCase

importstatic com.kms.katalon.core.testdata.TestDataFactory.findTestData

importstatic com.kms.katalon.core.testobject.ObjectRepository.findTestObject

import com.kms.katalon.core.checkpoint.Checkpoint as Checkpoint
```

```
import com.kms.katalon.core.cucumber.keyword.CucumberBuiltinKeywords as CucumberKW
import com.kms.katalon.core.mobile.keyword.MobileBuiltInKeywords as Mobile
import com.kms.katalon.core.model.FailureHandling as FailureHandling
import com.kms.katalon.core.testcase.TestCase as TestCase
import com.kms.katalon.core.testdata.TestData as TestData
import com.kms.katalon.core.testobject.TestObject as TestObject
import com.kms.katalon.core.webservice.keyword.WSBuiltInKeywords as WS
import com.kms.katalon.core.webui.keyword.WebUiBuiltInKeywords as WebUI
import internal.GlobalVariable as GlobalVariable
WebUI.openBrowser('')
WebUI.navigateToUrl('http://localhost:55727/')
WebUI.click(findTestObject('Object Repository/LO/Page_Home Page - Online zahtjevi/a_Kontakt'))
WebUI.click(findTestObject('Object Repository/LO/Page_Kontakt podaci - Online zahtje/a_Zahtjevi'))
WebUI.click(findTestObject('Object Repository/LO/Page_Pregled zahtjeva - Online zaht/a_O nama'))
WebUI.click(findTestObject('Object Repository/LO/Page_Informacije - Online zahtjevi/a_Poetna'))
WebUI.click(findTestObject('Object Repository/LO/Page_Home Page - Online zahtjevi/a_Online zahtjevi'))
WebUI.click(findTestObject('Object Repository/LO/Page_Home Page - Online zahtjevi/a_Zahtjevi'))
WebUI.click(findTestObject('Object Repository/LO/Page_Pregled zahtjeva - Online zaht/a_Detalji'))
WebUI.click(findTestObject('Object Repository/LO/Page_Detalji - Online zahtjevi/a_Nazad na listu'))
WebUI.click(findTestObject('Object Repository/LO/Page_Pregled zahtjeva - Online zaht/a_Uredi')
WebUI.setText(findTestObject('Object Repository/LO/Page_Ureivanje - Online zahtjevi/input_Ime_Ime'), 'Senad')
WebUI.setText(findTestObject('Object Repository/LO/Page_Ureivanje - Online zahtjevi/input_Adresa_Adresa'), 'Sjenjak 22')
WebUI.setText(findTestObject('Object Repository/LO/Page_Ureivanje - Online zahtjevi/input_Email_Email'), 'senad@test.com')
WebUI.setText(findTestObject('Object Repository/LO/Page_Ureivanje - Online zahtjevi/input_IznosKredita_IznosKredit'), '2500')
WebUI.setText(findTestObject('Object Repository/LO/Page_Ureivanje - Online zahtjevi/input_RokOtplate_RokOtplate'), '24')
WebUI.setText(findTestObject('Object Repository/LO/Page_Ureivanje - Online zahtjevi/input_RazlogNeevidentiranja_Ra'), 'Odustao od zahtjeva za kredit')
WebUI.click(findTestObject('Object Repository/LO/Page_Ureivanje - Online zahtjevi/input_Web ID_btn btn-default'))
```

```
WebUI.click(findTestObject('Object Repository/LO/Page_Pregled zahtjeva - Online zaht/a_Online zahtjevi'))

WebUI.closeBrowser()
```

7. Conclusion

Performance and user interface testing is a very important part of software development because it allows detection of bugs and unexpected software behaviour in an early stage, before software release. However, as a result of understaffing and general lack of interest, testing is still neglected in many companies from developing countries, resulting in a bugged release, lower customer satisfaction and lower revenue [3]. A correction after shipping is very costly and it affects the company credibility and organizations cannot afford losing customers due to these kinds of problems. To avoid these problems, organizations should follow a proper quality management plan to remove errors from the products [4]. Testing is important and should not be neglected.

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DESIGN AND DEVELOPMENT OF USER INTERFACES IN UBIQUITOUS COMPUTING

Abstract

We are heading towards the future that is very reminiscent, at least on paper, of one described by George Orwell in his "1984"-one that is bizarrely controlling and unpleasant. What is of particularly interesting is that this paradigm shift is happening right in front of our eyes, unseen. Considering the things being as they are, it is of crucial importance that we study the mistakes of past times in user interface design while relying on emerging technologies to realize and take control of our future. The goal of this paper is to explore development and design patterns of Ubiquitous User Interfaces (UUI), UUI classes and their ability to provide natural system inputs and outputs as well as the system's ability to keep UUIs in the periphery. This paper tries to get across the importance of these elements for the future design, development and application of any ubiquitous user interface.

Keywords: *Ubiquitous User Interfaces (UUI), smart environment, smart future, ubiquitous computing, input techniques*

1. Introduction

With all the artifacts in our environment imbibed with computation, input, and output, the future might become a very noisy and unpleasant place. Having that in our minds it is important to find ways to avoid mistakes that have been made in the past when it comes to interface design while relying on new technologies that are expected to help in realization of a useful future invisible "Everywhere" (Greenfield, 2006) where people remain in control. In the beginning of this paper we described what good interaction design is when we take in consideration factors such as affordance and human action cycle. This is described in terms of user-centered design (UCD), systems design and genius design, and how interaction patterns can be translated into design patterns. The realization of a UUI can start on already well-known user interface classes such as the Graphical User Interface (GUI). The following chapter describes different classes of user interface. Three most important classes of user interface that simulate natural interaction styles are: tangible user interfaces (TUIs), surface user interfaces (SUIs) and ambient user interfaces (AUI). This paper also describes most important forms of input modalities, specifically sensor input, gesture input, and speech input. We conclude this paper with a brief discussion of some suggested UUI usability metrics in the last chapter. These should be considered in the design, research, and development of any UUI.

2. What is Ubiquitous Computing?

Ubiquitous computing is the term given to the third era of modern computing. The first era was characterized by the one large mainframe computer which usually was used by many people. Second modern computing era is the era of the PC. As its name suggests, a personal computer is primarily used by one person. The third era that can be defined as ubiquitous computing is a representation of the present time. It is defined by use of small portable devices - smart phones, and embedded computers that are a part of many things we own "resulting in a world in which each

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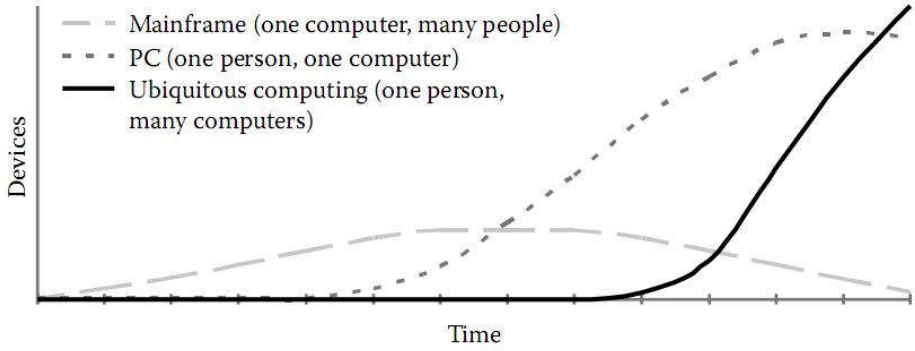
person owns and uses many computers." (Krumm, 2010) The number of computers we own has progressively increased through each of aforementioned eras (Figure 1.).

Figure 3. Graph conceptually portraying three eras of modern computing



Source: Ubiquitous Computing Fundamentals Krumm, 2010

Even though the trends in computing are easy to predict, the form and philosophy expected behind it is not quite clear. Like it was in past, the form will be shaped by the organizations that will work on them (Krumm, 2010). The first stages of ubiquitous computing started in the late 1980s and the most important researches were by Xerox Palo Alto Research Center (PARC), IBM Research, Tokyo University, etc.

Today, the most important representation of ubiquitous computing is a smart phone. It has become a very important object in everyday life and its' processors performance, connectivity, memory space and affordability makes it the most adopted and used ubiquitous computer ever (Krumm, 2010). Mark Weiser coined the original term "ubiquitous computing". In 1988 at Xerox PARC, where he was employed as the director of the Computer Science laboratory (CSL). Weiser perceived a future where technologies are incorporated in everyday objects ranging from ones that people use at work, for household objects as well as the ones we use for fun and play. Weiser's famous quote about future technologies in early 1991 is:

"The most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it." (Weiser, 1991)

3. User Interfaces for Ubiquitous Computing

For as long as the user interfaces have existed they represented the point where the interaction between humans and machines occurred; both in terms of input to the system as well as the output of the system itself. Pervasive computing, or ubiquitous computing as it is more commonly referred to, system has many aspects ranging the low level sensor technologies in the environment surrounding the user, through the collection, management and processing of contextual data to the middleware required that would enable the dynamic composition of imagined devices and service.

4. Interaction Design

Interaction design is the discipline of defining the expected behavior of products and systems that a user can interact with. Donald Norman (2002) states, "far too many items in the world are designed, constructed, and foisted upon us with no understanding - or even care - for how we will use them." By contrast, interaction design aims to make products and systems usable and useful, and even engaging and fun. When considering the various aspects of interaction design for ubiquitous computing, it is important to recall the breadth of the technological scenarios imagined. Often, these

scenarios rotate around people making connections to other people through ubiquitous computing systems, not just connecting to the system itself.

According to Symonds (2010), interaction design is a complex attempt and it is based on research, methods, techniques, and design guidelines from a range of overlapping and related fields and specialties including:

1. Cognitive psychology (metaphors, affordances, and mental models)
2. User experience design (storyboarding, personas, mockups)
3. Information architecture (shared data models, data stores)
4. Communication design (visual-auditory communication, graphic design)
5. User interface engineering (prototyping)
6. Human factors (human capability, ergonomics)
7. Industrial design (aesthetics)
8. HCI (new interface and interaction techniques)
9. Usability engineering (usability testing)

Good interaction design can be achieved in a number of ways depending on the complexity of the system proposed, its novelty, its degree of stability or ubiquity, and its cost. Design methodologies of interest to ubiquitous computing include user – centered design (UCD), systems design, and genius design. The difference between these three approaches is the degree of user engagement in the process versus how much this can be abstracted away. In order to better our understanding of these approaches we briefly outline the process of identifying user needs and their translation into requirements and specifications for the system. These are some of the first steps in system development life cycle. Much has been said about building correct user interfaces and systems that work according to user needs. However, correct systems can be built only if it is known exactly what the user needs and what the system must do. One of the most important factors in building correct systems, therefore, is to first clearly define what the system must do. Identifying detailed user requirements has always been important and is becoming even more so in the complex systems that are being developed now. (Hawryszkiewycz, 2001).

There are many ways to develop system requirements. One of these, however, is not simply sitting down and drawing a model of the system or setting user requirements in the privacy of an office. It can only be done by going out and discussing with users to find out what they require of the system and then building systems that satisfy these requirements. The requirement gathering methods may themselves depend on the kind of system being studied. So, it is necessary to determine the best way to identify requirements and then to spend some time studying the system, observing it, talking to its users, and obtaining information in many other ways about how the system works and what is needed of the new system.

5. User-Centered Design (UCD)

In UCD, users are involved at every stage of the process to help ensure that the system developed actually meets their needs and allows them to achieve their goals. (Krumm, 2010) As an approach to design, UCD dates back more than 30 years. It came from the realization that engineers frequently do not have the necessary skills required to develop user-friendly interfaces for computer systems. (Krumm, 2010)

5.1. Systems Design

Systems design is as its' name suggests, a systematic approach to design and development. A ubiquitous computing system is usually formed of many systems that include social systems (people), devices, sensors, and services all kinds of appliances. In systems design, the user needs that were documented are the most important guideline for system design. The most important

elements are computation and sensors. Inputs from the user are given from two different kinds of controls: explicit control (e.g., gesture), and implicit (e.g., inference) (Krumm, 2010).

5.2.Genius Design

Cousins and Varshney (2009) describe genius design as "the process of exclusively relying on the wisdom and experience of the designer to make all the design decisions." In their opinion a design patterns should heavily rely on designer's instinct and experience. This instinct and experience are developed over many successful projects and years of work. Many excellent devices, products, and systems in use today have come about from just this approach. But sometimes it can be tedious because of confidentiality issues end users cannot experience new products before it is officially released. It is believed that designers in Apple must produce 10 different versions of product for peer review and feedback in order to maintain confidentiality.

5.3. Design Patterns

Design patterns can be defined as solutions to common design problems, adapted to the certain situation (Symonds, 2010). Introduced by Christopher Alexander and his colleagues in the field of architecture in *A Pattern Language: Towns, Buildings, Construction*, patterns represent a "shared language" for a discipline. (Krumm, 2010) Patterns are largely used in software engineering in order to communicate common problems and appropriate solutions. Ubiquitous computing researchers have started to describe common design patterns for this field. Examples identified include Infrastructure (e.g., Proxies for devices), Privacy (e.g., Privacy Zones), Identification (e.g., Active Badge), Anticipation (e.g., ―Follow-me Musicǁ), Global Data (e.g., Interface teleporting), Discoverability, Capture and Access, Physical Space, and Location-based Services (e.g., Bluestar). (Symonds, 2010)

6. Classes of User Interfaces

The user interface is the point of contact between a user and computer system, both in terms of input and output from the system. The realization of this point of contact can exist in many forms and in many classes of user interface. In classical HCI texts, six classes are described that include command language, natural language, menu selection, form filling, direct manipulation, and anthropomorphic interfaces. (Poslad, 2009) Direct manipulation which is part of the GUI has made computers accessible to many people. GUIs rely on visual and spatial cues, which are faster to learn, are easier to remember, and provide context for the user.

From the WIMP paradigm developed in the Xerox Alto in the 1970s to the latest 3-D interface elements seen in Windows and Mac OS X, the GUI has tended to dominate what is considered a user interface. However, clearly, a keyboard, screen, and mouse with GUI elements tied to every device affording computational interaction cannot be the future. The advent of the UUI will draw on elements from all these classes of interface and more. There exist many further types of input technologies that will be discussed in chapter 4 of this paper which do not cleanly fit into any of these six classes because they rely on new devices. Examples include body movement in the form of gesture, speech, ambient feedback, surface interaction, and augmented reality (AR). (Krumm, 2010) Clearly, many new classes of user interface are being defined beyond these desktop-computing-bound six. Examples of this new class of interface include:

- Tangible User Interface (TUI)
- Surface User Interface (SUI)
- Ambient User Interface (AUI)

6.1.Tangible User Interface

TUI is a combination of both – control that we see virtually represented on screen in GUI, and representation of computation elements, in physical form. (Symonds, 2010) Basically, TUIs help provide physical form to computational artifacts and digital information. The precise definition of TUI as a system having both input and output forms in one has changed overtime. (Krumm, 2010) Accordingly, the most acceptable TUI definition is "a user manipulates a physical artifact with physical gestures, this is sensed by the system, acted upon, and feedback is given". (Krumm, 2010) The system components of TUI are both input, and can as well be an output device from the system. Compared to the GUI, usual TUI device does not make distinction between input and output devices.

6.2. Surface User Interface

An SUI is a type of user interface which is based on a self-illuminated (e.g., liquid crystal display (LCD)) or any other spherical, horizontal, vertical interactive surface that is connected with control of computation in the same physical surface (e.g., a touchscreen). (Krum, 2010) Like in TUI, input and output in SUI are closely connected. These are based on some computational techniques that include surface and capacitive detection of membrane, acoustic wave detection computer vision, and resistive membrane, to determine what is input from user to the system. (Krumm, 2010) Surface user interfaces are usually used in places such as kiosks, ATMs and other public places, or in small personal devices like PDA and iPhone where the usage of separate keyboard or mouse is pointless. The size of SUI is in range from small iPhone, PDA or other small personal devices, through a Tablet PC and much larger surface like Microsoft Surface as shown in Figures 6. (Krumm, 2010)

Figure 4.Microsoft surface detecting device and user touch

Source: http://www.reuters.com/article/2008/05/28/us-microsoft-

The most widely used input technologies in SUI include: passive stylus, active stylus, fingers, or tangible objects, or it may be connected to only one, like with the Tablet PC which has its active powered stylus. If we consider the fact that input to the SUI is used as a replacement for a mouse, many SUI applications work just like GUI, and as such are subject to same design and usability studies and metrics.

6.3. Ambient User Interfaces

SUIs require our engagement and involvement to operate correctly. We should consider "a calm technology that can move easily from the periphery of our attention, to the center, and back again" (Weiser, 1999). Ambient information displays or outputs are intended to be "ignorable" or "glanceable" allowing users to perceive the information presented in the periphery of their attention, but also to be bring this information (e.g., social reminders) into focus as required (Mikulecky,

Liskova, Cech & Bures, 2009). Although the periphery of our attention is a nebulous concept, it is grounded in the notion of our peripheral vision. Extensive research in vision science has demonstrated our abilities to recognize well-known structures and forms, to identify similar forms and particularly movements from outside our line of sight. In practice, an ambient display, sound, movement, or even smell can convey background or context outputs from a ubiquitous computing system. In the future, a low-power heating element or other peripherally ignorable form of actuation could provide constant ambient feedback one could selectively attune to. (Mikulecky, Liskova, Cech & Bures, 2009) An ambient output (display or other) does not constitute a full user interface because it does not incorporate input.

7. Input Technologies

An ubiquitous user interface cannot rely of the same input and output mechanisms like classical user interfaces; it requires much broader range. Examples of these inputs include physiological measurements, location, identity, video, audio, gesture, and touch. Also, all different kinds of environmental sensors, personal-embedded sensors, data mining, historical data, can be considered as inputs to a system. Examples of the outputs that can be ambient displays, environmental updates, automated actions and personalized behaviors, and multiple audio/video channels. (Krumm, 2010) Those outputs rely on all five human senses. As we previously stated, some of the user actions will be recorded and interpreted by the system without the user being aware of it, and in such manner some outputs will be delivered only to a periphery of user's attention. It is implied, of course, that many interactions between system and a user will be explicit, but omnipresent computing will many times happen without users being fully aware of it. We already reviewed the most important output technologies, so now we need to focus on three most important input categories which are: sensor input, gesture input, and speech input.

7.1.Sensor Input

A sensor is defined as any device that can measure any physical and measurable data from the environment. Sensors be worn on body or be placed somewhere in environment. These devices have been widely used through decades. With the pace of technological advancement they are becoming more sophisticated. Industrial applications such as an oil refinery have been using sensors for feedback and control for over 50 years. RFID technology has also been deployed in security systems for more than 40 years. Nowadays, sensors can be found everywhere.

7.2.Gesture Input

Any movement of a part of the body to express a meaningful idea is defined as a gesture. The most important and most widely used gestures are pointing, waving, or nodding are formed with the hand or the head. For example, in a sign language a specific configuration and movement of the hands is considered a gesture. Both basic gestures such as pointing and complex gestures in sign language rely heavily on the appropriate cultural, geographical, or linguistic frame of reference for their interpretation. (Krumm, 2010) A harmless gesture in one country can easily be interpreted as an insult in another. Therefore, gesture recognition can be defined as the process of interpreting gestures made by humans using different computational forms and technologies.

7.3.Speech Input

Speech is the ability to produce articulate sounds to express an idea or meaning, and is usually realized through a spoken language. Accordingly, speech recognition can be considered as the process of interpreting human speech using a variety of audio inputs and computational processing. Similarly as with video-based input processing, speech recognition is represented by a large amount of research, development, and commercial deployment.

8. Interface Usability Metrics

Usability is defined as a quality attribute that helps us to assess how easy user interfaces are to use. The word "usability" also can be referred to as a set of methods for improving ease-of-use during the design process. Usability is defined by five quality components: learnability, efficiency, memorability, errors, and satisfaction (Krumm, 2010) . For a UUI, we can describe a set of interface usability metrics, as shown in Table 1.

Table 2. Seven Key UUI Usability Metrics

Metric	Meaning
Conciseness	A few simple actions in a brief time can achieve a task. This can be measured by time (attention or gaze), keystrokes, gestures, and taps.
Expressiveness	Does a combination of actions not anticipated give consistent results?
Ease	How much does a user need to learn or to remember just to start using the interface?
Transparency	How much does a user need to remember about the state of their GUI?
Discoverability	Can the user easily understand and form a mental model of the interface functionality?
Invisibility	How much does the interface make itself know when it could have
Programmability	Can the application, device, or service be used in repetitive tasks or can it become a component in a larger system?

Source: Ubiquitous Computing Fundamentals Krumm, 2010

9. Conclusion

This paper has provided an overview of the classes of interface both new and old that may be suitable to realize interfaces of applications in environments imbibed with computation, input, and output. This paper started by setting the context for what a UUI is and therefore detailing 10 rules for UUI design. We have shown contrasting approaches to interaction design and how these have impacted on each other and the relative merits of each approach provided a rich description of different classes of user interface. Three novel forms of input modality are described. This paper concludes with interface usability metrics described and how these may be applied to future interface design. Although this paper offers a snapshot of the state of the art in UUI development, it is best viewed as an entry point to the some research papers cited here. Considerable research and development has been undertaken in both ubiquitous computing and the research areas that underpin the subject. Developing a UUI as a prototype or proof of concept to demonstrate an idea or run some small-scale user trials is fundamentally different to the realization of a UUI and system for use in the wild. In the wild, an interface is expected to have all the properties shown in the paper and more. Anything less constitutes risk that people will not purchase, adopt, or use the system. General usability metrics and our ubiquitous computing interface usability metrics are described in Table 1. When and where they are to be applied should be considered and reflected upon time and again in the research and development process.

The ultimate goal for ubiquitous computing is to have interfaces and therefore systems that seamlessly support the actions of their users. This kind of interfaces will certainly be the part of our near future; as Adam Greenfield (2006) states "With the pace of real-world development being what it is, this category of interface seems to be on the verge of widespread adoption.", but "…nevertheless, many complications and pitfalls remain for the unwary." In the future, enhanced

computational artifacts, environments, and full ubiquitous computing systems will become so commonplace in restaurants, colleges, workplaces, and homes that no one will notice their presence. Our job as researchers, designers, developers, and ultimately users is to constantly question this vision to ensure we end up with calm and blissful digital-physical experiences.

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Review paper / Pregledni rad

DEVELOPING WEB APPLICATION FOR E-HEALTH

Abstract

The research field of this paper is an analysis of the application of modern information technologies in e-health. The application of web, mobile and Internet of things technologies in the field of e-health will be analyzed. Development of e-health applications enables the provision of health services and expert assistance to patients in remote locations. The paper presents the model of e-health based on Internet of things. A web application has been developed to allow patients greater access to health services, providing expert assistance, advice and participation in the treatment process, clinical trials and early diagnosis of the disease.

Key words:*e-health, Internet of things, telemedicine, promotion of e-health*

1. Introduction

As medical institutions are expanding and evolving using IT services, the delivery of medical services is increasingly dependent on geographical boundaries, nationality, or institutional constraints. Following this trend, an increasing part of the health care process is being transferred from health facilities to home conditions (Radenkovic et al., 2015; DeNardis, 2012; Efrat and Esther, 2012).

One of the biggest problems with the health care system encountered by many countries in the world is the accessibility and the cost of healthcare services, which can be reversed under the influence of new information and communication technologies. This topic is of particular importance to the Balkan region due to the economic situation, and it is precisely the goal of this work to enable access to quality, expert information for people who are not able to personally visit a health institution or a doctor (Norman, 2006; International Telecommunication Unit, 2008).

The subject of research in this paper is e-health web applications, which have a significant role in providing information to patients in real time and facilitate the process of providing medical services.

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The emergence of mobile and wireless technologies has led to the development of new e-health services. A large number of m-health applications allow easier monitoring of the health status of patients at a distance and faster response to patient needs (Dzenowagis, 2005).

The field of research of this paper is an analysis of the application of mobile and electronic applications in health care. Business models of e-health, as well as advantages and disadvantages of each model, were analyzed.

In the practical part, an e-health web application has been implemented. It enables communication with medical stuff over the Internet and display all the information of importance, and with the use of smart sensors, it is possible to collect and process vital health data of patients in real time.

Chapter two of this paper describes the notion of e-health and the Internet of Things in e-health.

The research continues in chapter three where, through a comparative analysis of the functionalities of the most important e-health portals in Serbia, has been concluded on which areas to pay special attention when designing an e-health application.

Chapter four describes the process of developing and implementing the proposed Web application for eHealth, as well as detailed description of the functionalities the proposed solution has.

The last chapter is used to illustrate the results of the research, and the problems to which the proposed solution provides an answer. Web application enables: greater coverage of the population with medical staff, greater participation of patients in their own treatment and clinical research, easier use of resources, finding relevant information and advice for treatment, obtaining expert opinion from the most eminent doctors, reducing travel and other costs due to arrival for examination, reduction of waiting for providing health services, facilitating the process of diagnosis and processing of collected systematized data.

2. Application of Internet of Things in e-health

E-Health as a concept represents a relatively new practice in the healthcare of people, which uses new telecommunication channels to connect patients, i.e. people who need medical assistance on the one hand, and medical institutions, i.e., professional medical staff on the other (Fabrice, 2005; Radenkovic et al., 2017).

Electronic health care should enable the recording and archiving of data in health institutions, education of medical personnel, transfer of information content and better integration of various health care systems as a whole. The most important reason for the introduction of electronic healthcare is rationalization and reduction of health care costs, reduction of paperwork used, faster service delivery. Also, the use of e-health system enables easier access to health data, faster service delivery, facilitated education of experts, wider availability of medical information, and the establishment of global expert cooperation (Evans et al., 2011; Radenkovic et al., 2017).

E-health aims to create a fully integrated health system with sustainable business financing. E-health services should help measuring key indicators of health care, make evidence-based decisions, reduce costs, eliminate spatial distances, increase transparency and access to information, increase resource availability, improve administration, and encourage the development and advancement of society (Radenkovic et al., 2017).

Internet of Things (IoT) is one of the latest achievements of information and communication technologies, and it can be of great importance when it integrates with health services, especially e-health. Internet of Things connects various devices in our environment, such as sensors and other medical devices over the Internet, therefore modifying and improving the ways we interact with the environment (Lopez, 2013; Gartner, 2015; Bhat et al., 2017).

Internet of Things can be applied in many areas of our everyday life such as smart city, smart home, smart healthcare, smart manufacturing, intelligent transportation systems and so on. By collecting a

large amount of data from different types of sensors, new possibilities for advanced data processing for medical and other purposes are opening up (Trncic et al., 2018; Mann, 2014).

The base premise of the IoT is to facilitate the interconnection of people and things in real time and in different places, and this lays foundation for our study (Fielding, 2000; Bhat et al., 2017).

3. Analysis of Web Applications for E-Health

The following table analyzes the functionalities of applications for electronic healthcare in Serbia. Columns feature the most important e-health portals. The rows show the functionality of the given portals. For each portal it is identified whether it has a certain functionality or not. Based on this analysis, a precise picture of competitors in the field of electronic health was obtained as well as the conditions for quality design of the future application.

Through a comparative analysis of the most important e-healt portals in Serbia, it was concluded on which areas special attention should be paid when designing an e-health application.

Table 1: Comparative analysis of the functionalities of the e-health portals in Serbia

Comparative analysis of portals functionalities	Portals				
Functionalities	VMA	BelMedic	MojDoktor	Doktor.rs	Proposed Solution
Online scheduling consultations	–	–	•	–	•
Blog	–	–	–	•	•
Forum	–	–	–	•	–
News	•	•	•	•	•
Ads, baners	–	–	–	•	–
Telemedicine	–	–	–	–	•
Messaging	–	–	–	–	•
Promotions on social networks	–	•	–	–	•
Patients survey	–	–	–	•	•
Internet diagnostics	–	–	–	–	•
Using smart sensors	–	–	–	–	•

Most of the existing portals focus on an informative business model, which means they serve only as information support web pages for their basic business model. Portals of VMA and Belmedik hospitals are used to find important information about the treatment process itself, doctor's biographies, pricelist services, location, ways of communication, thus there is no special difference between the portals of private and state clinics.

On the other hand, the state-integrated health system MojDoktor can be considered as a two-way service, because it allows patients to find a doctor nearby on the portal, see his free consultations slots, and schedule an on-line review, greatly saving their time and money.

Finally, Doktor.rs portal represents the most comprehensive web application of these, because in one place a patient can see the latest health articles, correspond to a forum with other people in a similar situation, find a doctor or healthcare facility nearby, or fill out a survey about important topics.

As a result of this research and analysis of competitors' portals, we came to a conclusion in which direction the development of the web application functionalities should go further in this paper. The table summarizes the functionalities that the proposed solution should have. As the application is

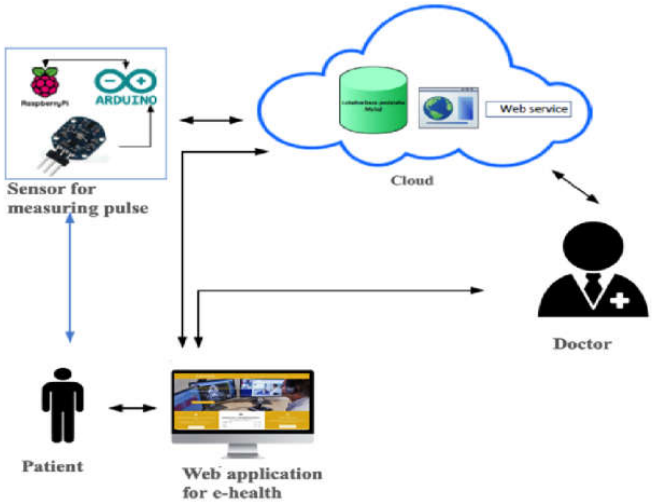
designed to be upgradable e-health application, it's possible to develop one part of the functionalities first, then monitor the patient's needs and develop new functionalities and gradually involve more and more different sensors for data collection in real time.

4. Developing of IoT aplication for e-health

A proposal for the architecture of web applications for e-health based on the Internet of things is given in this paper. The purpose of the web application for e-Health is to provide patients with critical information over the Internet using the latest information and communication technologies and wireless technologies in situations where they are not able to visit the doctor personally, which due to their distance or lack of time, providing them with relevant information and advice eminent experts.

The figure 1 shows the architecture of the e-Health application, based on the concepts of the Internet of things:

Figure 1: A model of e-health service based on the Internet of Things



Web application for e-Health should enable electronic scheduling of video consultations with a selected doctor for a narrow professional field of medicine, consulting with doctors on further course of treatment, interpreting results, collecting medical data on patients who have never been available for analysis before and provide uninterrupted care for patients with remote sensing devices. With the help of special device for pulse measurement based on Internet of Things, vital parameters in patients can be monitored and thus monitor the patient's medical condition in real time remotely. Also, the collected medical data can be further investigated and used to improve the process of treatment and diagnosis as well as to monitor the course of the disease.

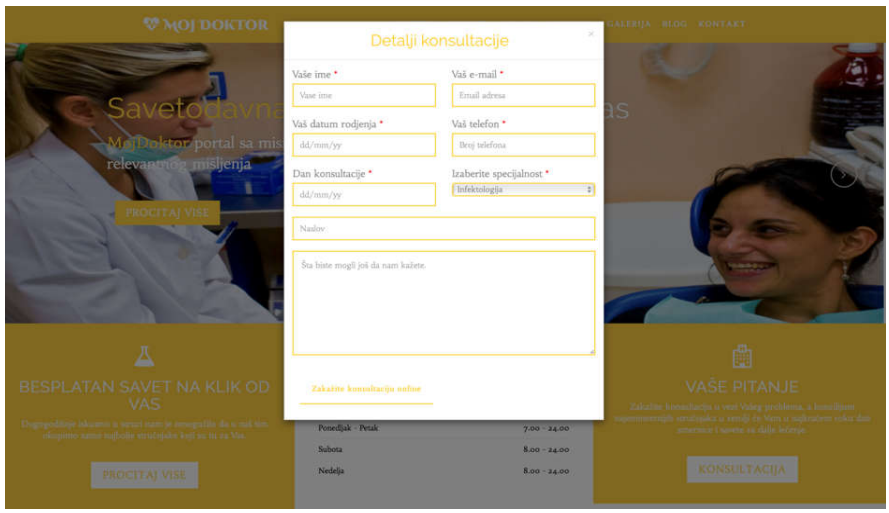
Within the web application, there is also a section for writing and editing medical articles, where users can find current information from the sphere of medicine, recommendations for treatment and post-operative recovery, leave comments, ask for more information, fill in surveys, participate in scientific studies and perform search for available doctors.

The following figure shows the home page of the implemented web application.

Figure 2: E-health web application homepage

When the web application is launched, the home page where the user has the following options is displayed: video call with a doctor, scheduling consultations, information about specialists, commenting on posts, searching for a doctor, filling out a poll, searching inside a blog, exchanging messages with doctors. The user on the home page has the ability to fill in the form, and enter all the information about his problem. The data is inserted into the database through the form, the user chooses the day when he is most suitable for having an examination and later talk about the details with the assigned doctor. The form for scheduling consultations is given in figure 3.

Figure 3: Form for scheduling consultations



One of the most important functionalities of the web application for e-health is the possibility for people in need to get in touch with doctors through video calls. In the application, Skype API is integrated, which enables the communication of doctors and patients through video calls in real time. At a doctor's request, the patient can activate a pulse sensor during video consultation so that the doctor can monitor the patient's condition in real time. Web site page with video call functionality is shown on figure 4.

Figure 4: Video call with specialists

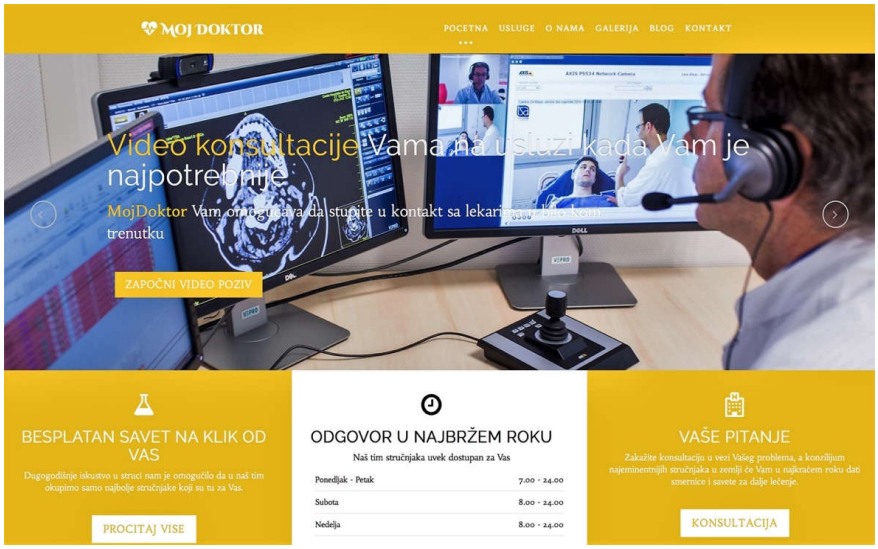
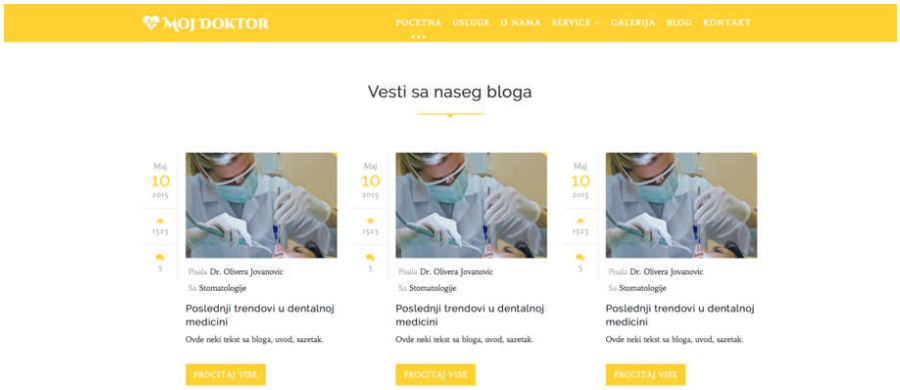


Figure 5 shows the implemented *livechat* in the application as the first step in commencing communication.

Figure 5: Exchange of messages with specialists in real time

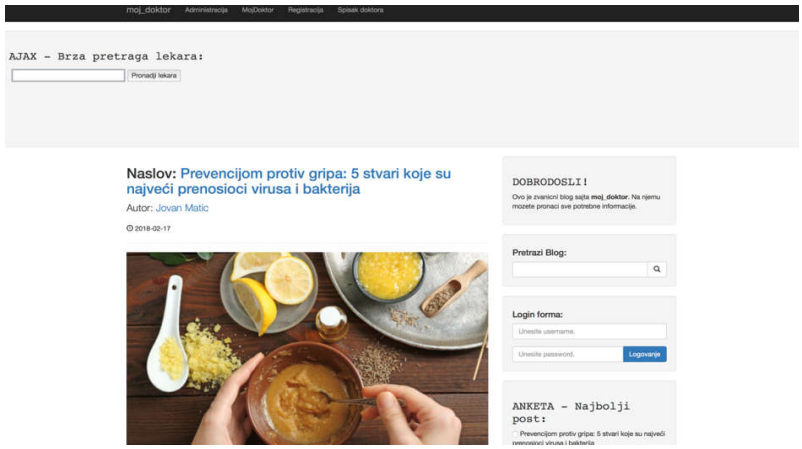
Figure 6 shows a separate section of the home page of the portal containing the most relevant medical news that can be accessed by every user of the site and information about useful things related to current topics in healthcare.

Figure 6: View the latest blog articles on current topics in the field of medicine



Clicking on “read more” navigates to a separate section of the web application, where you can read medical articles, read comments, write your comment, or vote for the best article. The web application can be searched by key words, titles and doctors. In a separate section it is possible to interview patients in order to collect important data for clinical research or to improve the functioning of the portal. The following figure shows the layout of the web application page with the latest articles in the field of medicine.

Figure 7: Medical Blog home page



As the portal is created as a CMS system, it is possible to log in with credentials, and see all the important data from the database. It is possible to search for available doctors, look at historical data on measurements of vital parameters. Figure 8 shows the search results for available doctors and their specialties.

Figure 8: All available doctors

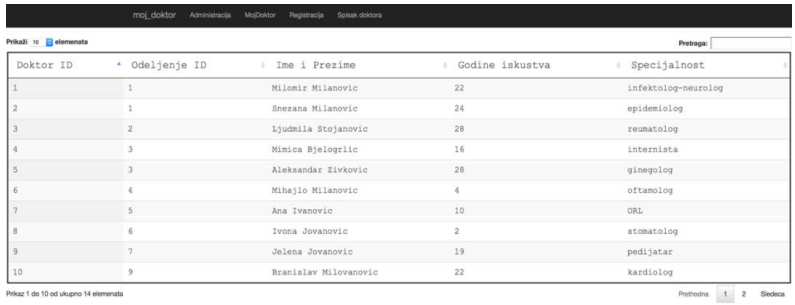
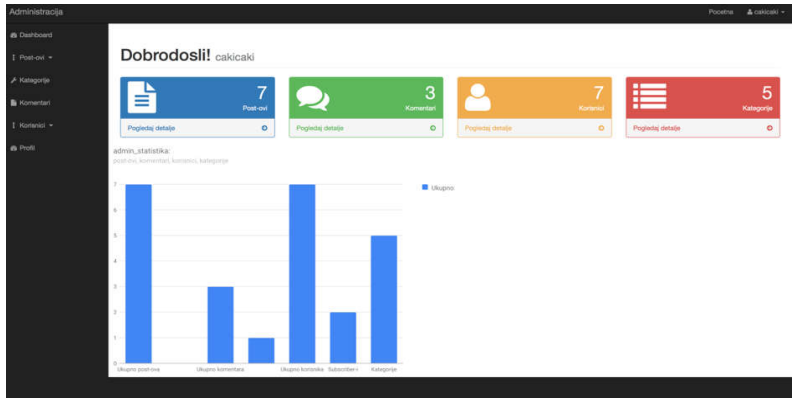


Figure 9 shows the page for portal administration.

Figure 9: Portal administration page



5. Conclusion

Internet and mobile technologies enable healthcare services to be available to as many people as possible, with lower costs, better use of resources, better information, eliminating large paperwork and persistent losses that occur in traditional healthcare business models.

The field of research of this paper is the application of web applications in healthcare and the possibility of implementing new services based on concepts of the Internet of intelligent devices through the web platform for e-health.

Healthcare as a sector where there are many shortcomings in the functioning efficiency is an area where there is a huge need for the use of web services, and it is precisely in the different variants of applications and web services the future of progress in the health care process in Serbia.

One part of the research in this paper related to the evaluation of examples of electronic health in Serbia. The two models of state and private web sites for e-health, their functionalities, advantages and disadvantages are analyzed in order to provide as a result of this research the best way of doing business and to discover and solve the observed shortcomings in the proposed model.

The paper proposes an e-Health model based on the Internet of Things that, in combination with sensors for measuring vital health parameters, facilitates the process of communicating patients with medical personnel and finding relevant information related to human health, with a model of business that is applicable in Serbia and in Serbian to the population.

As the final result of the research, a web application for eHealth has been designed and implemented using modern web application programming technologies that enable greater coverage of the population by medical personnel, greater participation of patients in their own treatment and

clinical trials, better use of resources, easier access to relevant information and advice for treating, obtaining expert opinions from eminent doctors, reducing travel costs and waiting times.

Research directions in the future relate to the development of new application services that can be applied in eHealth, as well as on the inclusion of an increasing number of sensors for collecting health parameters in real time.

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Professional paper / Stručni rad

USE OF INFORMATION TECHNOLOGIES TO IMPROVE THE SAFETY OF COAL MINING

Abstract

Safety systems in the mining industry are of great importance for the general safety of people and equipment, considering harsh and high-risk conditions of this environment. It is therefore essential to have advanced safety systems and staff trained for monitoring daily operations. Besides monitoring, such systems can also help us prevent catastrophic malfunctions, provide support during incidents and achieve better organization. Due to the nature and complexity of the environment, advanced information systems are required for real-time monitoring of operations and work conditions in surface and underground mining. Innovative information technologies find significant applications in various mining fields (surface and underground mining), from design documents to management and supervision of production processes in mines. In mining, IT is used for data processing and management, 3D designing, modeling and spatial database integration with the application of obtained results. These technologies include readymade software packages for designing of quarries, surface and underground mines, satellite tracking devices and equipment, navigation devices, and devices for simulation and remote control of mining machines.Safety management is a major issue in all mines. The aim of this paper is to demonstrate how information technologies can enhance security of people and material and technical resources in mines.

Keywords:*mining, computer programs, information technologies, engineering/design*.

1. Introduction

Safety systems in the mining industry are of great importance for the general safety of people and equipment, considering harsh and high-risk conditions of this environment. It is therefore essential to have advanced safety systems and staff trained for monitoring daily operations. Besides monitoring, such systems can also help us prevent catastrophic malfunctions, provide support during incidents and achieve better organization (Jovičić, Miljković, Nuić, Uljić, Vukić, 1987) (Matthews, 1987). Such information systems require advanced hardware and complex software and this significantly influences and increases implementation costs. An affordable solution would be to utilize already available and highly developed cloud technologies in combination with the Internet of Things (IoT) devices that use wireless technologies to interact with the rest of the system. Advanced cloud technology is crucial in the achievement of intellectualization and networking of video surveillance and monitoring systems for a high-performance platform in mines. Nowadays, mines mostly use analogue systems such as CCTV cameras and a large number of monitors as one system, with a set of different sensors and communication devices as separate systems. The advantage of cloud technology is that all of these systems can be integrated into one control platform with a centralized control system. This makes it possible to set up a large number of wirelessly connected cameras and sensor devices, whose data would be stored directly on a cloud server, with subsequent automated extraction of significant events and changes by intelligent software. In addition to lower initial costs of complex hardware installation, another advantage of a cloud monitoring system is an increased

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level of security owing to incomparably faster reporting of situation, incidents and changes. This paper presents the capabilities and applications of modern computer technology for improvement of safety in the mining industry and, particularly, in coal mines.

Availability of a large amount of information at all times, capability to extract essential data and use them when needed, and their utility value are of the utmost importance for a successful managing engineer. Increasing requirements placed on engineers of all profiles create the need for tools that collect, store and, on demand, present the required information, accurately and timely. In the context of mining, and particularly underground exploitation of mineral resources, we can conclude that accurate information are of the utmost importance for making a good decision, because, in this industry, human lives are always on stake.

One of the information systems often deployed in mines is Geographic Information System (GIS). By definition, "GIS is a potent set of tools for collecting, storing, searching as needed, transforming and displaying of spatial data from the real world for specific purposes".[3] GIS presents the entire space surrounding us by means of three geometric elements: a point, line and polygon. All that surrounds us can be graphically presented using these three elements, while associated attribute values are used to describe the environment completely. Spatial data are data on spatial entities, identifying the spatial position and shape of natural or artificial facilities, such as roads, rivers, cadastral parcels or waste rock dumps, i.e. of everything that can be showed on a map, including properties of such facilities and their mutual relations.GIS enables users to create queries, analyze spatial information, edit data, and present the results of all these operations.Simply put, GIS is "a smart card" enabling its users to ask questions, analyze displayed information and edit data related to a given card. In the mining industry in BiH, the potential of GIS remains untapped, although it has a lot to offer. The lack of knowledge in this field, as well as the incomprehensible reluctance of individuals result in slow introduction of GIS into the mining of Bosnia and Herzegovina.

2. Coal mines in Bosnia and Herzegovina

JP Elektroprivreda Bosne I Hercegovine d.d. Sarajevo (Public Electric Utility Company of Bosnia and Herzegovina) is a joint stock company in which 90.37% of the capital is owned by the Federation of BiH, and 9.63% by minority shareholders. As of 2009, Elektroprivreda BiH has the status of the parent company in the EP BiH Concern, with a number of mining and equipment manufacturing companies as its subsidiaries.

By the Agreement on the Transfer of Shares, JP Elektroprivreda BiH acquired the ownership rights over the shares in the following coal mines: Rudnici „Kreka", RMU „Kakanj", RMU „Zenica", RMU „Breza", RMU „Đurđevik", RMU „Abid Lolić"IRMU „Gračanica". In addition to the mines mentioned above, there are also mines that are not part of the EP BiH Concern: Rudnici mrkog uglja Banovići, Novi Rudnik mrkog uglja Miljevina d.o.o., Rudnici ugljena Tušnica, Rudnik Terex-Kop (Mezgraja), Rudnik mrkog uglja Kamengrad, Rudnik Stanari, ZP RiTE Gacko a.d., and ZP RiTE Ugljevik a.d.

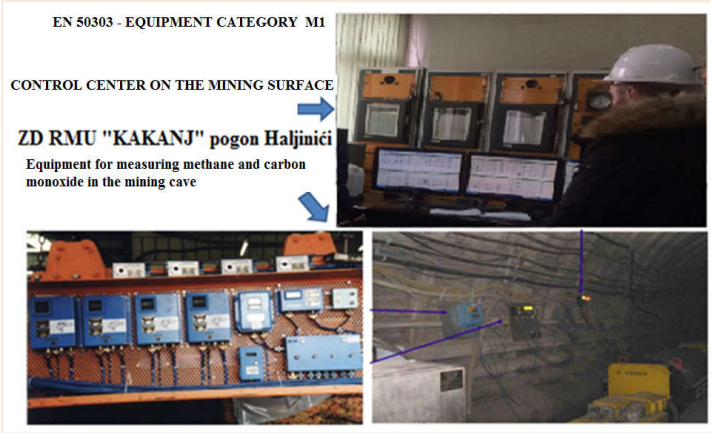
[3]Geographic Information Systems GIS, n.d. Available on:https://gisgeography.com/

Figure 1. Map - coal mines in Bosnia and Herzegovina

Source: Authors

In order to modernize and streamline technological and business process in these mines, as a precondition for their successful operation, it is necessary to fully implement a Single Information System (SIS) in each of them. Establishment of a single information-communication-control system enables functional, reliable, and fast exchange of information from a single database for the purposes of the Business Information System (BIS) and Technical Information System (TIS), using IT services (Active Directory, e-mail system, antivirus protection, OS unification, server environment virtualization, Microsoft products licensing from server environment, Internet) between organizational units within a mine, centralized administration of the units' local computer networks, both in operational and technical segment, as well as the possibility of establishment of a central video surveillance system, access control, and utilization of VoIP technology. In order to ensure technical preconditions for a successful establishment of the mentioned functions of the system, it is necessary to finalize activities on the implementation of information-communication infrastructure that needs to meet the requirements regarding bandwidth and remote control of local networks of individual units.

Figure 2. Information-communication infrastructure in Kakanj Coal Mine



Source: Authors

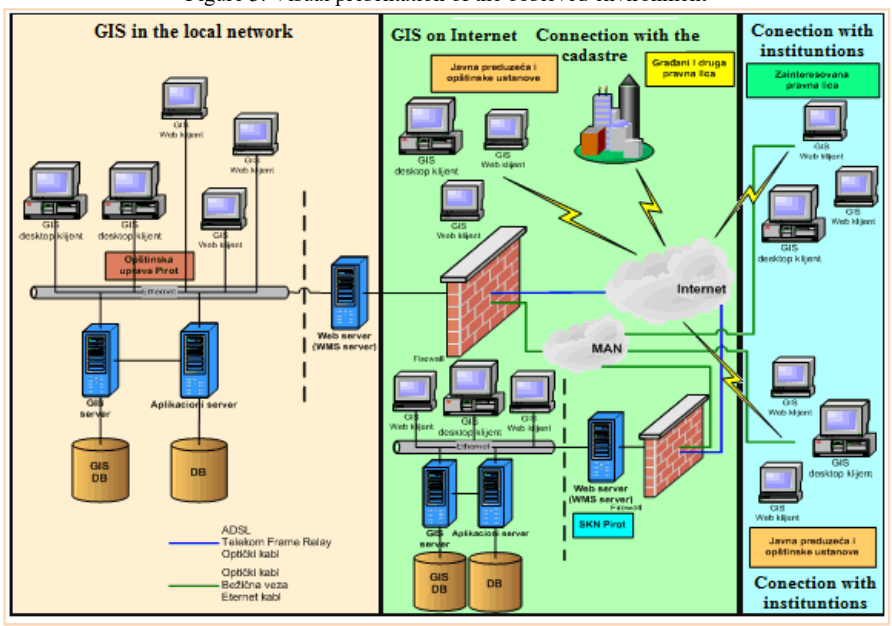
3. Applying cloud video surveillance in mining

Applying cloud video surveillance allows comprehensive monitoring and real-time control from any site with Internet access. Therefore, operators can check environmental parameters, natural gas concentration, carbon monoxide level, negative pressure, temperature, and wind speed, as well as the operational state of equipment, fans and air systems at any given moment and any given location. The automated extraction of significant events is displayed on the operator's screen, in the form of tabular data and charts (RGF Beograd, 2017). Reports include statistical data reports, warnings, electricity variations, anomalies, signal variations, and equipment malfunction warnings. Advanced analysis systems can also predict collisions of vehicles with workers or facilities within a mine.

Due to the nature of the environment, it is important to also integrate a GIS, in order to improve the safety system control. GIS collects, updates, updated, analyzes, transfers and controls all geographic information on in both underground and surface environment.

GIS provides the operator with a rapid, precise and systematic visual presentation of the monitored environment, thus increasing the level of safety of mining operations. Such a system can be called a hybrid monitoring system and an example of it is provided in Figure 3. This is a set-up of surveillance and GIS services, such as correlation, positioning and alarming, significantly changes the traditional setting, providing control systems for mining operations safety with a significantly higher level of control and security systems gain considerably higher level of regulation and control.

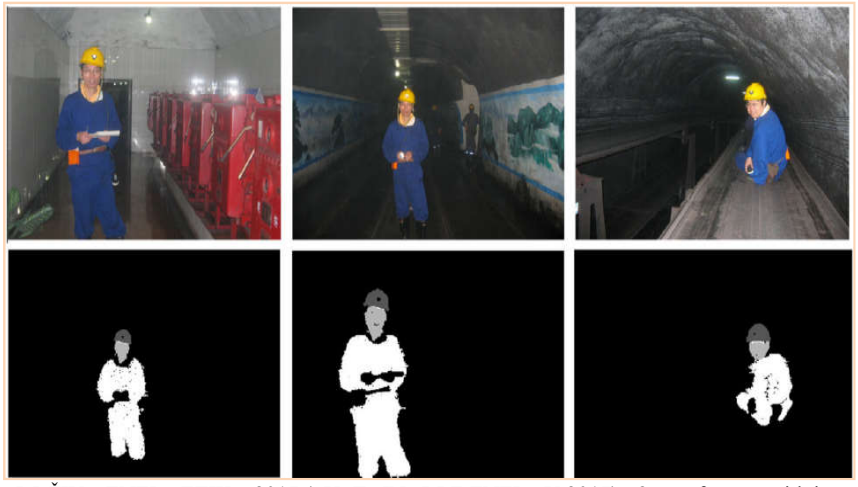
Figure 3. Visual presentation of the observed environment



Source: Geographic Information System - GIS

Figure 4 shows an intelligent software processing of video material in which the system recognizes a miner and separates him from the working environment. For example, it may be used to detect unauthorized entry into restricted parts of a mine, unauthorized use of equipment or a miner falling down. This method allows for fast processing of a large amount of video material because only separate objects are taken into account in individual frames (ODRŽIVA ENERGETIKA, 2017).

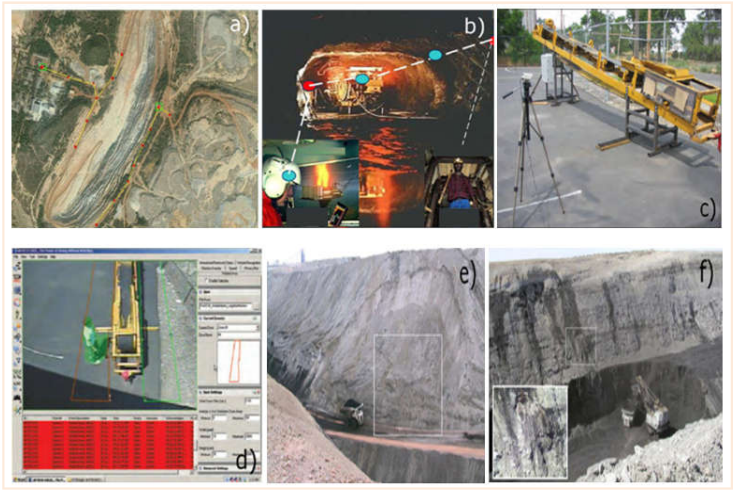
Figure 4. The appearance of supervision and the results of segmentation in a mine



Source:ODRŽIVA ENERGETIKA 2017 (SUSTAINABLE ENERGY 2017) - 2. Conference with international participation

Figure 5 gives different possibilities of utilization of a video surveillance system in the mining industry (ODRŽIVA ENERGETIKA, 2017):
a) arrangement of cameras and sensors at a surface mine,
b) blue and red dots indicate sensors in an underground mine,
c) system setting for the detection of improper machine handling,
d) displaying software of the system for detecting improper machine handling,
e) landslide detection system at a surface mine.

Figure 5.Surveillance image and the result of segmentation of various parts



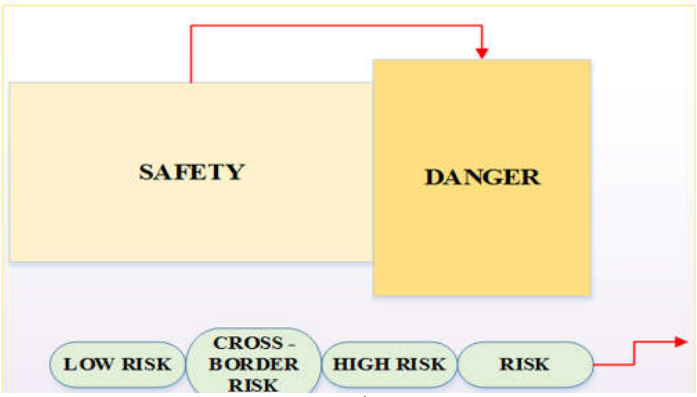
Source:ODRŽIVA ENERGETIKA 2017 (SUSTAINABLE ENERGY 2017) - 2. Conference with international participation

4. Safety technology and information systems in mines

The starting point in considering safety techniques in mines is the risk to humans and environment. The risk is defined as the probability of occurrence of incidents that lead to damage. Border risk is

the maximum permissible risk of a particular technical process or state (RGN Zagreb, 2007), (RGF Beograd, 2017). Figure 6 shows the areas of safety and danger, with their borderline set by border risk.

Figure 6. Areas of safety and danger



Source: Authors

Information systems (IS) are built to achieve several goals. One of the primary goals is economic data processing and their transformation into information or knowledge. These terms are defined as follows:

- Data refer to the elementary description of things, events, activities, and transactions that are recorded, classified, and stored, but are not organized to convey any specific meaning. Data can be numeric, alphanumeric, digits, sounds, or images.
- Information is data that have been organized so that they have meaning and value to the recipient. The recipient interprets the meaning and draws conclusions and implications.
- Knowledge consists of data or information that have been organized and processed to convey understanding, experience, accumulated learning and expertise to the current problem or activity. Nowadays, knowledge management is one of the most current topics in the field of Information Systems (IS).

Enterprise management through ERP systems is a novelty at the market and various ERP systems are increasingly used in modern operations. ERP is an abbreviation of Enterprise Resource Planning- Resource Planning in Corporations and the most widely used ERP in the world is SAP - Systems Anwendungen und Produkte (in English: Systems, Applications and Products). The fact is that 74% of the top 500 companies in the world use the SAP solution. ERP is a set of activities supported by a multi-modular application software, which helps in managing business, financial aspects of business and human resources. Every period of human civilization was accompanied by certain challenges. This is relevant today and will be relevant in the future. The introduction of information technologies and the Internet leads to changes in the organizational structure, as well as in the personnel structure, authority, power and content of the business, as well as planning of careers and employees, and especially in management. Automation is actually a substitute for the human mind in process management. Automatic regulation studies the law of transmission and processing of information in self-rectifying processing systems and methods of study. The theory of automatic regulation is the basis for resolving regulatory problems in production through the development of empirical methods in process and energy plants, as well as in machine production. The obligation to establish and modernize the functions of monitoring, communication, alarms and evacuation systems for mining operations, in which there is a risk of major accidents.

5. Types and characteristics of computer programs in mining

The application of IT in resulted in development of new methods of designing surface and underground mines, which significantly differ from traditional methods. They are called modern

methods of designing and modeling. The basic prerequisite for their application is formation of an appropriate database of geological and mining data, as well as of a mineral deposit model. Modern design and modeling methods are based on the integration of IT into the mining operations. In developed countries, modern methods of designing and modeling have already been used for thirty years, while mining design in the countries of southeast and eastern Europe is still based on traditional methods. The essence of IT application in mining is reflected in linking the functions of planning, design, control, analysis, decision-making, and feedback, through increased production, productivity, reliability, operational safety and operability. This concept of operating activity results in information-management systems of multistep hierarchical logic, with built-in artificial intelligence functions, high supervisory-managerial efficiency and development of a new generation of "intelligent" mining machines - robots. Modern computer programs use various methods as the basis for application development; the ones most commonly used are Lerchsa-Grossman method (LG), Floating Cone Method - floating coupe and dynamic programming. The LG method has a leading role in relation to other design methods.

Computer programs used in mining can be divided into the following groups, according to their purpose (RGF Beograd, 2011):

- ⇒ general purpose software packages: mining computer programs for deposit modeling and projecting excavation in both surface and underground exploitation,
- ⇒ specialized software packages for the optimization of surface and/or underground exploitation and analysis of the excavation of metallic and non-metallic mineral raw materials,
- ⇒ specific-purpose software packages, intended for the analysis of specific problems related to the design of mining or for the design of exploitation technology, for example: for analyzing the costs of excavation or analyzing certain technical problems in surface exploitation (analysis of slope stability), designing the exploitation system (drilling and mining, truck transport, loading and transport) and others.

Today, in mining sector, many computer programs are used that are adapted toward specifics that describes mining industry. Some of the most important professional mining computer programs are (RGF Beograd, 2011):

- Gemcom applications are designed for geological interpretation and modeling of unstratified deposits and the design of surface and underground mining of metals and non-metals.
- Surpac's computer program is widespread in world mining practice. It is used for designing solutions for surface and underground exploitation, with the presentation of exploratory works.
- Computer program GEMS is used for research, modeling, design of surface and underground mining works, long-term planning and production monitoring.
- Minex Pit Optimizer uses the Lerchs-Grossman algorithm to determine the optimum contour of the dig, which is suitable for high-bay beds.
- The MineSched computer program is intended exclusively for monitoring the processes and activities of surface and underground exploitation, generating long-term and short-term exploitation plans.
- RockWare has developed software support that can be applied to the following areas: geology, engineering and visualization of surface and underground exploitation data with a set of RockWorks programs and a geo-mapping area with an array of ArcGIS programs.
- The US company ESRI offers one of the most complete GIS solutions in the ArcGIS software collection that are used to create, input, process, analyze, and display geographic information in a geo-information system (GIS).
- MicroStation is a package of software CAD programs for the production of 2D and 3D graphic documentation. The latest version of the MicroStation V8i software is intended exclusively for Microsoft Windows operating system and includes a fully audited Direct3D-based graphical

subsystem, PDF literature, task management, and keyboard shortcuts. Visualization capabilities for photo-realistic rendering and animation are enhanced.

- Computer program Vulcan presents a set of tools for analyzing the geological structure of deposits, modeling of block models, calculation of reserves, design of the plan and monitoring of exploitation, as well as for managing these processes. The software package can be expanded with additional modules for creating a database of geodetic measurements, for the production of mine roads, design of drilling and mining works, determining transportation costs based on block models, geomechanical modeling, It is possible to connect it with the ArcGIS software package.
- MineSight 3D uses an interactive interface for processing and displaying data from exploration and mine wells, composite models, 3D block models, stratigraphic and terrain modeling, surface and underground data measurement data, etc. It contains tools for interpretation of geological data, determination of topographic contours, network and triangulated surfaces. It provides complete 3D design of underground mining works, CAD editing of poly-lines and bodies, cross-sections and 3D spatial objects, triangulation functions and visualization of all layers of mining and geological objects.
- Datamine is a computer support system for surface and underground mining, as well as for the raw material processing industry. The Geological Data Management System (GDMS) and the system for the management of reserves of mineral resources, the development of the exploitation plan, the design of mining facilities, the management of mining works and the monitoring of production have been developed.
- GBIS is a data and data management system based on the following modules: Core, Professional, Coal and Sample Tracker. Core module is used to build a robust data management system that is adaptable to the needs of the Mine.
- Computer program Oasis Montaj serves for analysis, processing, 2D and 3D interpretation of geophysical, geochemical and geological data. Integration of field and field data from boreholes, as well as geophysical models, facilitates expert interpretation. Different types of data can be entered into the program, for example, data in certain points, networks and images, vector and 3D data, data from measuring instruments, GIS data, network and block models, etc.
- AutoDESK is the founder of the industry standard for 2D and 3D technical design and modeling. AutoCAD is a computer program belonging to the CAD program group and does not belong to professional mining programs, but is used in mining for the production of technical documentation. In addition to mining, AutoCAD is used in construction, architecture, mechanical engineering, electrical engineering and other fields, with specially customized versions of programs for each area.

6. Systems and solutions for the safe operation of a mine

The main feature of systems and solutions for the safe operation of a mine is the ability to work safely in an environment in which stability and reliability are threatened by the explosion of methane, dust, humidity and other hazards both at surface mines and in pits (ZAM-SERVIS, 2018.)

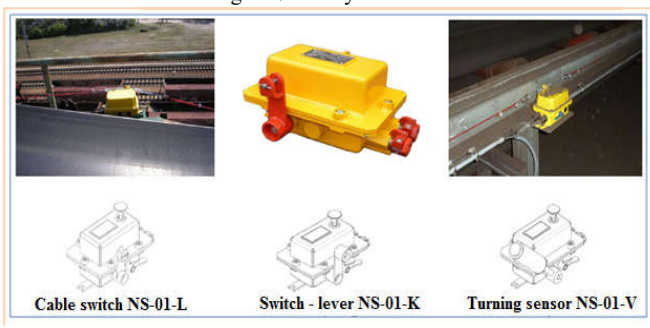
ISI systems has next functionalities:

- Identification and location of materials,
- Identification and localization of persons,
- Monitoring the number of persons in a particular area,
- Control of the access of authorized persons to a particular area,
- Determination of working hours in Coal Mine,
- Identification and location of faces and / or materials on the conveyor belt,
- Identification and localization of the person in the aftermath of incidents - accidents,
- Identification and localization of mining machines, e.g. locomotive, excavator,
- Positioning of the mining excavator (combination loaders),

- Communication by advertising,
- SMS messages,
- Production management and logistics.

Figure 7 shows safety switches for conveyors in underground minerals exploitation with risk of explosion of gas, surface mines and thermal power plants.

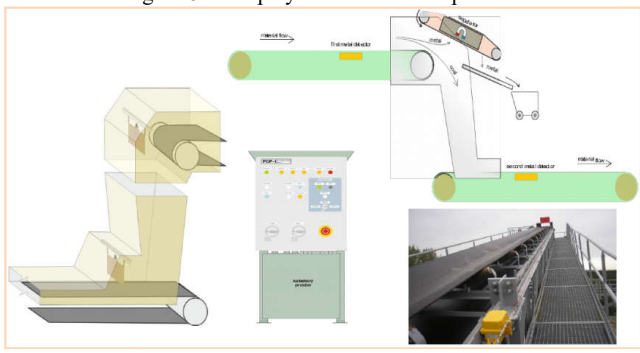
Figure 7. Safety switches



Source:Company ZAM-SERVIS s.r.o. (2018)

Figure 8 gives automation: equipment safety, metal detectors and separators for conveyors in underground and surface exploitation of mineral resources and thermal power plants.

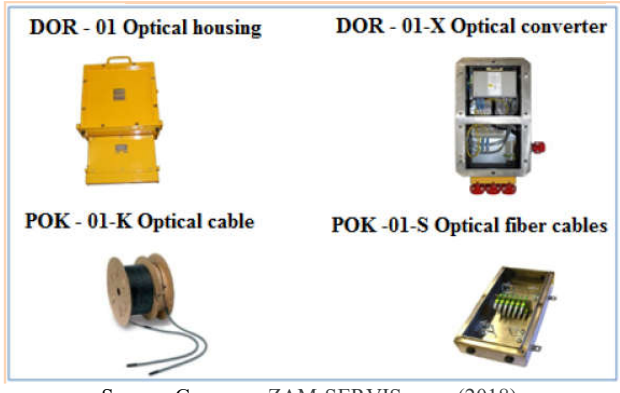
Figure 8. A display of an automated process



Source: Company ZAM-SERVIS s.r.o. (2018)

On Figure 9 equipment for optical network is shown, used for underground exploitation of mineral resources with a risk of explosion of gas.

Figure 9. Optical network equipment



Source: Company ZAM-SERVIS s.r.o. (2018)

7. Conclusion

The paper presents the advantages of using information technologies, i.e. a cloud-based video surveillance system in the mining industry compared to traditional technologies. Such a system enables the detection of security threats, incidents, alarms, and remote control of control mechanisms. In the context of safety and security in mines, the system provides real-time data on the location and activities of workers and equipment, the level of toxic substances and gases, and the unauthorized entry of civilians into the exploitation field of the mine. Real-time data provide an early warning of possible hazards, making it easy for operators to issue instructions to workers to eliminate the causes or evacuate. The advantages of information technologies, i.e. the cloud system are reflected in the rapid processing of video materials, intelligent software for its analysis as well as reduced operating costs. These operational frameworks have great applicability and safety management potential in different scenarios with adaptive adjustments to the complex mining environment. All mine sites with machines that are to a certain extent operated and handled by people are inevitably at some risk that can result in incidental situations. In order to minimize these risks, it is necessary to conduct risk analysis related to the specific application of information technologies and take certain protection measures accordingly.

Safety at work must be the goal of every mine because it represents a state of conditions created to avoid or limit health hazards and hazards to machines and devices. Occupational safety is a collection of a number of factors, each of which has its own position in solving the problem. From all this, it is obvious that the virtue of humanity is the core of occupational safety, as it takes care of people, i.e. miners. The managements of all mines should invest in occupational safety measures through the introduction of information technology where possible, since occupational injuries and occupational diseases lead to increased labor costs. It is important to recognize the importance of a healthy worker and to avoid additional costs resulting from accidents at mining sites. In Bosnia and Herzegovina, safety at work in the mining industry is low in all operational phases, from research to exploitation and processing of mineral resources. In order to improve the situation, which is of interest to all, a major action of the State is necessary. Occupational safety issues have been growing in importance, especially when it comes to large companies of importance for the State and society, such as mining production systems. The efficiency of production with a satisfactory degree of safety and protection of employees at work is an imperative that has no alternative. Both processes, production and management of the protection system, depend to a large extent on efficient planning and timely and efficient decision-making for each of the processes separately. Despite all the modern technical measures taken in obtaining mineral resources, there is always a chance a mining disaster may occur. Mining managers have to take this into account, since the consequences of mining disasters mostly affect the operation of the mine, causing economic damage. However, the greatest and irrecoverable loss is if people suffer in them. When planning and managing exploitation of mineral resources, it is not humane to save money and make mistakes in the field of technical protection from injuries and mining disasters. In addressing this issue, for reasons of humanity, it is not desirable to apply the principle of optimization or maximization of profit at the expense of increasing the likelihood of the danger of injuries to workers.

More safety in a mine can be achieved by analyzing all influencing factors and their programming and adjusting to ergonomic safety conditions of exploitation. What scientific method of research will be applied depends on the factor being investigated. The final goal of the analysis is to build programs to increase work safety. In 2017, Synergy Soft developed a solution that integrates data from several different systems used by Kakanj Coal Mine. When there are several mutually independent information systems in one organization and each of these information systems covers a part of operations, then there are several data sources in the organization. In order to obtain data on each operational segment one needs to access a specific information system and it is not possible to create reports with joint data from several different systems. In such case, it is necessary to

develop a single location which is integrated with the existing information systems and provides access to all operational parameters. In doing so, special emphasis should be placed on visualization of data, generation of necessary reports and access to data from various devices, using the Internet.One such solution was developed for the needs of Kakanj Coal Mine.

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PLANNING TO IMPLEMENT IT SERVICE MANAGEMENT BASED ON ITIL

Abstract

Over the years, IT has become the backbone of businesses to the point where it would be impossible for many to function without it. IT is no longer separate from but is an essential element of the enterprise. The basis idea of the IT service management is that organizations need to carry out IT planning and management on the business and IT services that it needs, rather than starting IT planning from underling technology and stuff they have to build services with. Information Technology Infrastructure Library (ITIL) grew from collection of best practices observed in the IT service industry. But, there can be difficulties with planning, implementing and running the IT service management processes. Most organizations will encounter issues of not knowing where to start. Every organization will have to start somewhere and the best starting point will be to identify where the organization is now in terms of IT Service Management maturity and where it want to be. Primary objective of this article is to help organizations assess current IT Service Management maturity level so they can decide whether or not to start with IT service management improvement initiatives based on ITIL.

Keywords:*ITIL, IT services, service management, planning.*

1. Introduction

It has become increasingly recognized that information is the most important strategic resource that any organization has to manage. Key to the collection, analysis, production and distribution of information within an organization is the quality of the IT Services provided to the business. It is essential that we recognize that IT Services are crucial, strategic, organizational assets and therefore organizations must invest appropriate levels of resource into the support, delivery and management of these critical IT Services and the IT systems that underpin them. However, these aspects of IT are often overlooked or only superficially addressed within many organizations. (Cartlidge et al, 2012)

Large numbers of organizations that use IT depend on IT to be successful. If IT processes and IT services are implemented, managed and supported in the appropriate way, the business will be more successful, suffer less disruption and loss of productive hours, reduce costs, increase revenue, improve public relations and achieve its business objectives.

There can be difficulties with planning, implementing and running the IT service management processes. Most organizations will encounter issues of not knowing where to start. Every organization will have to start somewhere and the best starting point will be to identify where the organization is now in terms of IT service management maturity and where it want to be. Primary objective of this article is to help organizations assess current IT service management maturity level so they can decide whether or not to start with IT service management improvement initiatives based on ITIL.

2. What is ITIL?

In the 1980s, the quality of IT services provided to the British government was such that then CCTA (Central Computer and Telecommunications Agency, now Office of Government Commerce, OGC) was asked to develop an approach for efficient and cost-effective use of IT

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resources by British public sector organizations. The aim was to develop an approach independent of any supplier. This resulted in the Information Technology Infrastructure Library (ITIL). ITIL grew from collection of best practices observed in the IT service industry.

ITIL gives a detailed description of a number of important IT practices, with comprehensive checklists, tasks, procedures, and responsibilities which can be tailored to any organization. Where possible, these practices have been defined as processes covering the major activities of IT service organization. The broad subject area covered by the ITIL publications makes it useful to refer to them regular, and to use them to set new improvements objectives for IT organization. The organization can grow and mature with them. (Pierre, 2014)

A number of other IT service management frameworks have been developed on the basis of ITIL, generally by commercial organizations. Examples include Hewlett-Packard (HP ITSM Reference Model), IBM (IT Process Model), Microsoft (MOF) and many others. This is one of the reasons why ITIL has become the de facto standard describing a number of fundamental processes in IT service management.

It is also important to mention ISO/IEC 20000 a service management system (SMS) standard. It specifies requirements for the service provider to plan, establish, implement, operate, monitor, review, maintain and improve an SMS. The requirements include the design, transition, delivery and improvement of services to fulfill agreed service requirements. (ISO/IEC, 2018)

The initial version of ITIL consisted of a library of 31 associated books covering all aspects of IT service provision. This initial version was then revised and replaced by seven, more closely connected and consistent books (ITIL V2) consolidated within an overall framework. This second version became universally accepted and is now used in many countries by thousands of organizations as the basis for effective IT service provision. In 2007, ITIL V2 was superseded by an enhanced and consolidated third version of ITIL, consisting of five core books covering the service lifecycle, together with the Official Introduction. (Cartlidge et al, 2007)

Although some authors characterize ITIL as “IT Governance frameworks” it is in fact management frameworks. (Van Bon et al, 2007) IT governance is distinct from IT management. Governance determines who makes the decisions. Management is the process of making and implementing the decisions. IT governance is about who is entitled to make major decisions, who has input and who is accountable for implementing those decisions. It is not synonymous with IT management. IT governance is about decision rights, whereas IT management is about making and implementing specific IT decisions. (Broadbent, 2003)

3. What is IT service management?

To understand what service management is, we need to understand what services are, and how service management can help service providers to deliver and manage these services.
A service is a means of delivering value to customers by facilitating outcomes customers want to achieve without the ownership of specific costs and risks. (Cartlidge et al, 2012)

The outcomes that customers want to achieve are the reason why they purchase or use the service. The value of the service to the customer is directly dependent on how well it facilitates these outcomes. Service management is what enables a service provider to understand the services they are providing, to ensure that the services really do facilitate the outcomes their customers want to achieve, to understand the value of the services to their customers, and to understand and manage all of the costs and risks associated with those services.

Service management is a set of specialized organizational capabilities for providing value to customers in the form of services. (Cartlidge et al, 2012)

There are several ways of delivering an IT service, such as in-house, outsourced and partnership.

IT service provision, in all organizations, needs to be matched to current and rapidly changing business demands. The objective is to continually improve the quality of service, aligned to the business requirements, cost-effectively. To meet this objective, three areas need to be considered (OGC, 2002):

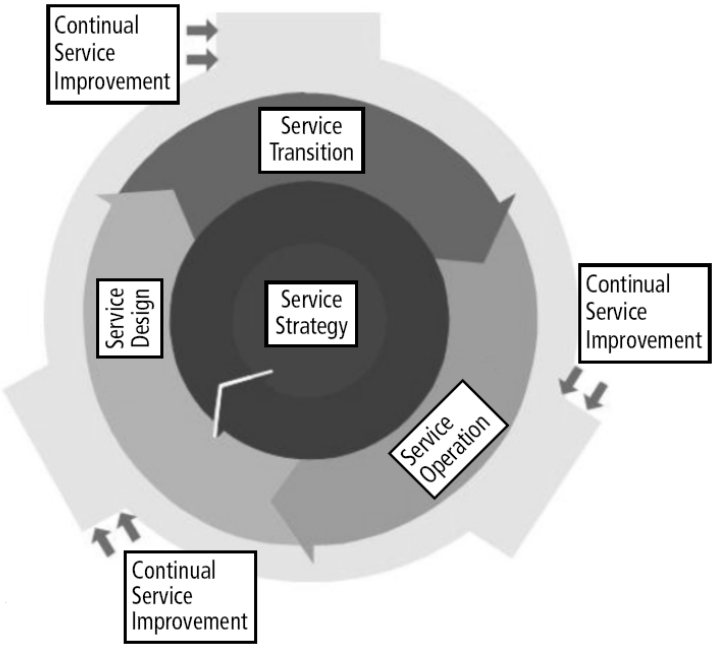
1. People with the right skills, appropriate training and the right service culture
2. Effective and efficient service management processes
3. Good IT Infrastructure in terms of tools and technology.

These three areas will only facilitate the implementation or realization of the objectives if they are considered in relation to a conscious, structured mechanism of alignment or 'steering' towards concrete business focused goals. Unless People, Processes and Technology are considered and implemented appropriately within a steering framework, the objectives of service management will not be realized.

4. Service lifecycle

Service management is concerned with more than just delivering services. Each service, process or infrastructure component has a lifecycle, and service management considers the entire lifecycle from strategy through design and transition to operation and continual improvement (Figure 1) (Cartlidge et al, 2012).

Figure 1. Service lifecycle (Cartlidge et al, 2007)



5. Service Strategy

The service strategy of any service provider must be grounded upon a fundamental acknowledgement that its customers do not buy products, they buy the satisfaction of particular needs. Therefore, to be successful, the services provided must be perceived by the customer to

deliver sufficient value in the form of outcomes that the customer wants to achieve. (Cartlidge et al, 2012)

Achieving a deep understanding of customer needs, in terms of what these needs are, and when and why they occur, also requires a clear understanding of exactly who is an existing or potential customer of that service provider. This, in turn, requires the service provider to understand the wider context of the current and potential market places that the service provider operates in, or may wish to operate in.

A service strategy can not be created or exist in isolation of the over-arching strategy and culture of the organization that the service provider belongs to. The service provider may exist within an organization solely to deliver service to one specific business unit, to service multiple business units, or may operate as an external service provider serving multiple external businesses. The strategy adopted must provide sufficient value to the customers and all of the service provider's stakeholders – it must fulfill the service provider's strategic purpose.

6. Service Design

Service Design is a stage within the overall service lifecycle and an important element within the business change process. The role of Service Design within the business change process can be defined as:

The design of appropriate and innovative IT services, including their architectures, processes, policies and documentation, to meet current and future agreed business requirements. (Cartlidge et al, 2012)

Service Design starts with a set of business requirements, and ends with the development of a service solution designed to meet documented business requirements and outcomes and to provide service design information for handover into Service Transition.

7. Service Transition

The role of Service Transition is to deliver services that are required by the business into operational use. Service Transition delivers this by receiving the service design information from the Service Design stage and delivering into the Operational stage every necessary element required for ongoing operation and support of that service. If business circumstances, assumptions or requirements have changed since design, then modifications may well be required during the Service Transition stage in order to deliver the required service. (Cartlidge et al, 2012)

Service Transition focuses on implementing all aspects of the service, not just the application and how it is used in 'normal' circumstances. It needs to ensure that the service can operate in foreseeable extreme or abnormal circumstances, and that support for failure or errors is available. This requires sufficient understanding of:

- potential business value and who it is delivered to/judged by
- identification of all stakeholders within supplier, customer and other areas
- application and adaptation of service design, including arranging for modification of the design, where the need is detected during transition.

8. Service Operation

The purpose of Service Operation is to deliver agreed levels of service to users and customers, and to manage the applications, technology and infrastructure that support delivery of the services. (Cartlidge et al, 2012).

It is only during this stage of the lifecycle that services actually deliver value to the business, and it is the responsibility of Service Operation staff to ensure that this value is delivered.

9. Continual Service Improvement

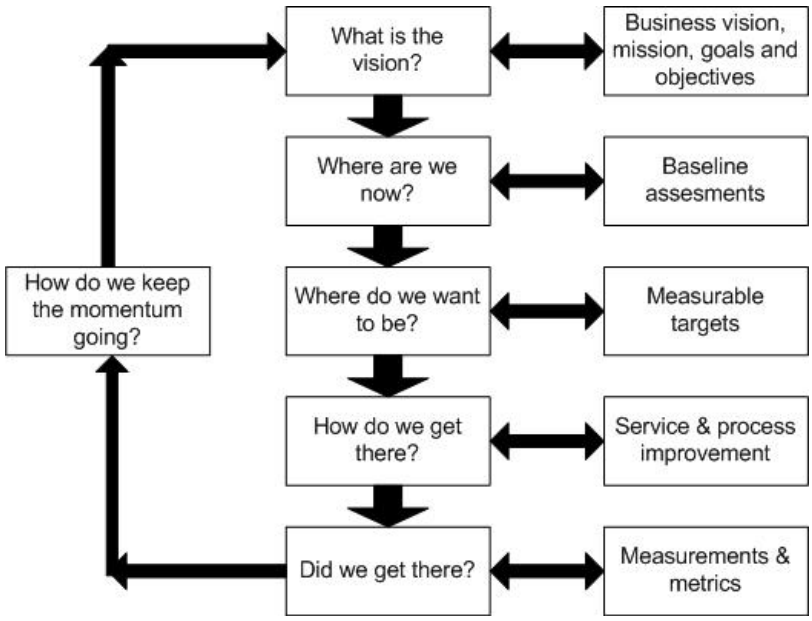
Continual Service Improvement (CSI) is concerned with maintaining value for customers through the continual evaluation and improvement of the quality of services and the overall maturity of the ITSM service lifecycle and underlying processes. (Cartlidge et al, 2012)

CSI combines principles, practices and methods from quality management, Change Management and capability improvement, working to improve each stage in the service lifecycle, as well as the current services, processes, and related activities and technology.

CSI is not a new concept, but for most organizations the concept has not moved beyond the discussion stage. For many organizations, CSI becomes a project when something has failed and severely impacted the business. When the issue is resolved the concept is promptly forgotten until the next major failure occurs. Discrete time-bound projects are still required, but to be successful CSI must be embedded within the organizational culture and become a routine activity.

The CSI Model shown in Figure 2. provides a way for an organization to identify and manage appropriate improvements by contrasting their current position and the value they are providing to the business, with their long-term goals and objectives, and identifying any gaps that exist. This is done on a continual basis to address changes in business requirements, technology, and to ensure high quality is maintained.

Figure 2. The Continual Service Improvement Model (Cartlidge et al, 2007)



The strength of the ITIL lifecycle rests upon continual feedback throughout each stage of the lifecycle. This feedback ensures that service optimization is managed from business perspective and is measured in terms of the value business derives from services at any point in time through the service lifecycle. At every point in the service lifecycle, monitoring, assessment and feedback flows between each stage of the lifecycle drive decision about need for minor course corrections or major service improvement incentive.

10. Where to start?

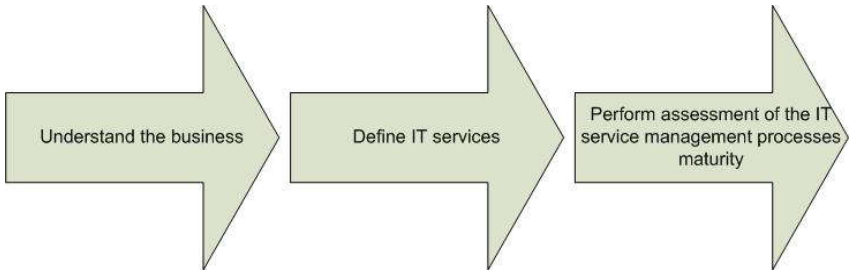
Some organizations will encounter issues of not knowing where to start.

Every organization will have to start somewhere and the best starting point will be to identify where the organization is now in terms of IT service management maturity and where it want to be.

IT service management maturity assessment should follow a systematic process to ensure all fundamental business aspects and IT-service support activities are understood and considered.

Figure 3 depicts a logical work-flow progression using a top-down approach in IT service management maturity assessment process.

Figure 3. IT service management maturity assessment process



The first step in IT service management maturity assessment should be to understand the business.

Next, any organization, large or small, needs to focus initially on the services that it delivers to its customers, along with as clear as possible a picture of who those customers are.

Figure 4 illustrates simple service catalogue example.

Figure 4. Service catalogue example (OGC, 2009)

Service name	Service description	Service type	Supporting services	Business owner(s)	Business unit(s)	Service manager(s)	Business impact	Business priority	SLA	Service hours	Business contacts	Escalation contacts	Service reports	Service reviews	Security rating
Service 1															
Service 2															
Service 3															
Service 4															

Once organization has identified the elements currently have or are proposing, organization need to understand how these create value for its customers. This analysis can often identify services or activities organizations currently undertake, but which do not provide value or support business outcomes. These are prime targets for freeing extra resources (people, money etc.) to focus instead on areas that do deliver value.

After organization get a clear picture of organization's IT services, the third step is to perform assessment of the maturity IT service management processes.

Almost everyone already has some form of service management processes. The question is how well they do it.

Process maturity levels can help identify a current baseline of maturity and a set of improvement initiatives.

The Process Maturity Framework (PMF) can be used either as a framework to assess the maturity of each of the ten service management processes individually, or to measure the maturity of the overall service management process as a whole. This is an approach that has been widely used in the IT industry for a number of years, with many proprietary models being used by a number of organizations. This particular PMF has been developed to bring a common, best practice approach to the review and assessment of service management process maturity. This framework can be used by organizations to internally review their own service management processes as well as third party organizations brought in as external assessors/auditors. (OGC, 2002)

The maturity of the service management processes is heavily dependent upon the stage of growth of the IT organization as a whole. It is difficult, if not impossible, to develop the maturity of the service management processes beyond the maturity and capability of the overall IT organization. The maturity of the IT organization is not just dependent upon the maturity of the service management processes. Each level requires a change of a combination of elements in order to be fully effective. Therefore a review of processes will require an assessment to be completed against the five areas of:

1. Vision and strategy - the overall direction as it relates to the role and position of IT within the business
2. Steering - the objectives and goals of IT in relation to realizing the strategy
3. Processes - the procedures needed to achieve the goals and objectives
4. People - the skills and abilities needed to perform the processes
5. Technology - the supporting infrastructure to enable the processes to be carried out
6. Culture - the behavior and attitude required in relation to the role of IT within the business.

11. Justification

It is important to make a clear business justification for service management system implementation. What benefits will the business itself get from improved IT service management processes?

IT service management must make a difference to the whole organization. It must make the business processes more efficient and more effective. How the business sees IT achieving this also needs to be understood, e.g. business efficiency, cost reduction in IT Service Delivery, increased Customer satisfaction with Service Delivery or more reliable IT Services to support business critical services. In all probability it will be all or most of these things.

As well as considering the current quality of IT services and a possible need to initiate a quality improvement programme, organizations wishing to initiate a Continuous Service Improvement Program - CSIP need also to be aware of business and IT market developments and what these mean to their IT organization. Understanding these general trends in the context of the organization will help determine how ITIL can best be utilized, not only for improving the quality of existing IT service management practices, but also for aligning them with changing business demands.

The benefits of IT service management must be identified in order to justify implementing the processes.

There will be costs involved with planning, implementing and running service management processes. Costs will occur in several areas such as staff (both permanent and consultancy staff to help with the project), new hardware, new software tools and accommodation. However these costs must be compared with the cost of not implementing suitable processes.

There will be difficulties with planning, implementing and running the IT service management processes. Most, if not all, organizations will encounter one or more of these issues (OGC, 2002):

- An overall lack of commitment from IT staff and Customers
- Insufficient commitment/interest from senior business management
- Insufficient knowledge of business strategy
- Resistance to Change
- How to maintain 'business as usual' while implementing Change with limited resources
- Lack of planning
- Inappropriate expenditure: too little and the processes will not be implemented and run effectively, too much and the cost justification will be lost
- Lack of staff skill
- Lack of (or inadequate) tools to underpin the defined processes
- Lack of service culture
- Not knowing where to start
- Making the business case
- Staff not given sufficient authority to make the required decisions
- Loss of the service management 'champion' (the person driving the implementation)
- Loss of impetus during the implementation project
- Difficulties seeing the overall picture resulting in over-focus on isolated or unconnected processes
- No-one accountable
- Failing to quantify and specify the desired results and benefits as they relate to the organization's situation and drivers or a failure to capture, measure and report on results and benefits
- Expecting major benefits too quickly
- Not understanding that the desired results and benefits can only be obtained by the implementation and integration of a number of ITIL processes
- Not understanding that implementing service management to achieve results and benefits is a combination of people, process, and technology
- Handover from development to live operation is not handled effectively
- Failure to Implement and Deliver

12. Different implementation approaches

There is no universal 'right way' of implementing service management within an organization. However there are a number of different approaches that have been used by organizations in the

past to achieve significant degrees of success. These different approaches can be categorized in to three major types (OGC, 2002):

- Single process approach
- Multi-process approach
- All-processes approach.

Each organization needs to evaluate the alternative approaches and select the most appropriate for them in their current situation. The approach selected for implementation by an organization should be reviewed at regular intervals to ensure that it is still appropriate.

12. 1. Single-process approaches

This involves the implementation, development or improvement of a single process at a particular moment in time. These approaches are normally, only used in the short term because it quickly becomes evident that significant improvements cannot be made by instigating enhancements within a single process. Therefore organizations rapidly move to either a ‘multi’ or ‘all’ process approach. These approaches are normally triggered by internal IT initiatives.

12.2. Multi-process approaches

These involve the implementation, development or improvement of a number of processes concurrently. These approaches are often either initiated by, or involve, considerable discussion with the business and/or the IT Customers.

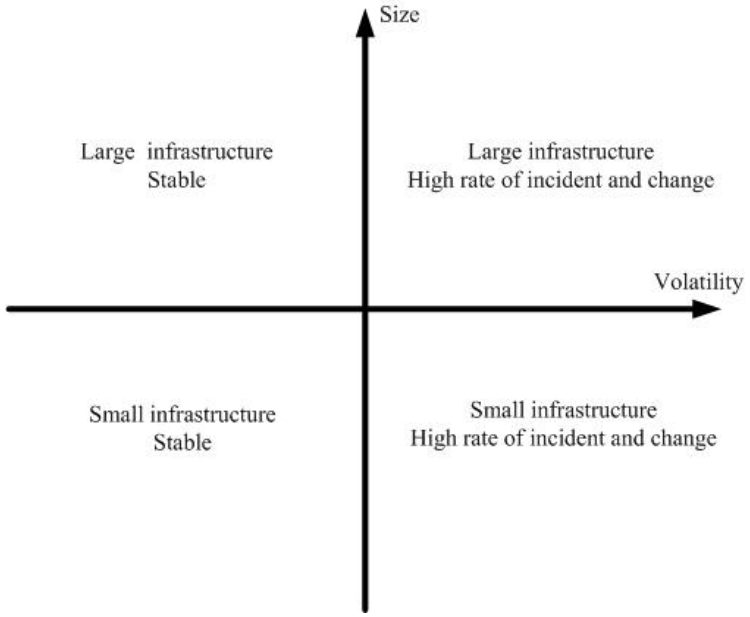
12.3. All-processes approaches

This involves the implementation, development or improvement of all service management processes simultaneously.

13. Stability consideration

The stability of an organization’s use of service will influence the relative size of the IT organizations and the overall organizations. Figure 5 shows the different scenarios which arise from combining stability (the number of communications with others) with infrastructure size (hardware, software and number of costumers). Some volatile organizations have low stability, and therefore a particular need for more intensive IT service management.

Figure 5. Stability consideration (OGC, 2007)



In practical terms, stability is reflected in the number of:

- Reported incidents
- Request for change
- Contacts with external suppliers and maintainers

14. The bottom-right guardant

A small, dynamic ITSM organization will need to draw from all five stages of the service lifecycle. While some ITIL processes scale down easily and function equally in small or large environments most will be break if scaled down too far.

Scaling down the service lifecycle to fit the workload expected and recourses available is at core of adapting generic best practices to small organizations.

It is important to remain aware that – however small the organization – the purpose is to manage the services provided, not merely to deliver isolated aspects of support or correction. However far service management is scaled, it must still contain all the key aspects that make up service management. Scaling down means "reducing in size", and while some simplification may be necessary to deliver service management with restricted resources, simply missing things out will not do the required job. The service lifecycle needs to be scaled down, not cut down.

15. The left quadrants

In both left quadrants, stability is the major characteristics. There may be more then one reason why an IT organization finds itself in this position. It could:

- have earned stability by tailoring the IT service to user needs
- be supporting a static customer base
- have budget and funding issues that are inhibiting change and growth

There may be other reasons, some of which imply an awareness of ITSM, and others that do not.

Whatever reason for stability; it could change very rapidly due external influences. Being aware of ITSM will always be of benefit to an IT organization, whatever its size. But unless that change takes place, ITSM is not probably not an area that would justify specific process improvement investment; rather such issue would be addressed over longer period through standard process review cycles.

It the lover-left quadrant, the organizations is unlikely to have significant focus on IT. In the smallest stable organizations IT service will be simple, taken as given and relatively low cost. In the upper-left quadrant, the larger size of overall organization will make the IT spend more significant, but stability will permit delivery of the IT services via a small IT organizations.

16. Top-right quadrant

This type of organization is the traditional target of mainstream ITIL guidance.

17. Conclusion

Over the years, IT has become the backbone of businesses to the point where it would be impossible for many to function without it. IT is no longer separate from but is an essential element of the enterprise.

The basis of the IT service management's idea is that organizations need to carry out IT planning and management on the business and IT services that it needs, rather than starting IT planning from underling technology and stuff they have to build services with.

Most managers want to take ideas which have proved valuable elsewhere and try them out in their own environment. This is sensible practice – it is after all philosophy upon which ITIL is based. However, no two organizations are alike, and in order to translate ideas successfully from one environment to another, processes and procedures must be adapted to fit.

ITIL is about Continual Service Improvement, and it does it by providing model processes to use as target or ideal in defining, documenting, measuring, managing and improving our own processes.

ITIL is a transformation not an implementation. The processes are there already – organizations just change them to a standardized way of doing them.

Process maturity levels can help identify a current baseline of maturity and a set of improvement initiatives.

The implementation of service management is not a one-off project but rather a continuous process of service improvement. There is a need to continuously understand where improvements are required to ensure the service provision is maintained at a high standard. There will be a need for active and ongoing staff commitment especially from senior management.

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M. Sc. Mahir Zajmović[1] *Review paper / Pregledni rad*

DATABASE SECURITY - EXAMPLES OF ATTACKS TO DATABASE

Abstract

Database attacks have become a common occurrence lately, so the security of the database is very important. If sensitive data comes into the "hands" of malicious users the damage is multiple. Often there are cases of identity theft or credit cards theft and stealing money from these cards through online purchases. This article lists the most common forms of attacks on databases, popularly called "SQL injection" and also provides practical examples of 'SQL' queries for different types of attacks on databases.

Keywords:*security, database, attack, SQL injection, protection.*

1. Introduction

Database is a collection of different objects and some of the well-known databases are:

- Oracle,
- Microsoft SQL Server,
- MySQL or
- PostgreSQL , etc.[2]

We access the tables through ''queries'' and that is why it's called ''Structured Query Language'' (SQL). Most of the software on the Internet use databases, from forums and all the way to different portals. Today in the world most of the work is done on the Internet. Using your Internet explorer, users can use many services that are offered by the Internet companies. Some of them are online shopping, earning discounts by registration on different portals, communication with other users, saving and storing their own files and data, etc. All of the mentioned is done by using websites.

Websites are common targets of the malicious attackers and with their attacks they want to gain benefits using the flaws on websites. It is very hard to make a website that will be entirely safe from all kinds of attacks, therefore any website is in danger if the attacker is skilled and persistent. The consequences of the attacks can include the theft of sensitive data about users or crashing of the website, therefore preventing the use of services that it provides.
SQL injections are the attacks by injecting the code in which input data are included in dynamically constructed SQLquery and they are treated as SQL code. On the websites that rely on databases, SQL injection vulnerability is especially expressed considering that the attackers easily find them and intrude the database. Vulnerable can be all the websites which for their operating use databases. Since that inserting the SQL code is a serious attack with consequences like disclosure of confidential information, it is necessary to protect the website as much as possible.

2. The types of attacks on databese

The most known forms of the attacks by inserting the SQL code are using input fields for data entry on the websites like the fields for searching or the fields entering your accounts name and password. The attack is possible if the data which are inserted by the user, are not checked in the right way. This form of the attack by SQL injection code is often called ''order injection'', because the maliciously formed SQL code which is inserted by the attacker in the input field directly affects on

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[2] http://www.phearless.org/i1/SQL_Injection.txt, visited, 7 January, 2019

the database and is performed immediately. SQL injection represents the attack on the security of the data which are held in some database. The attack means inserting the foreign code into the vulnerable application by the attacker with the goal of changing the condition of database or bypassing some security mechanisms. With XSS (link is external) the most common attack is on the web applications. Depending on the level of application vulnerability on this type of the attack, the attacker will be able to perform some or all of the operations on the data in databases (viewing, modification, deleting and adding).[3]

One of the classification of the attack by inserting SQL codes is made based on the purpose of the attack:

- **Bypassing the login:** using the attack by inserting SQL code the attacker bypasses the login on the system with username and password. Alternatively, the attacker can login as another legitimate user whose information he got by detecting the information from the database.
- **Gathering the information about databases:** the main goal of the attacker is not to gather the information from the database, his main goal is to get the information about the type and structure of the database. Inforamtion about table names and atributes in databases help in performing some of the serious attacks by inserting the SQL code.
- **Revealing the data from database:** the main goal of the attacker is to obtain information saved in the database. Most often the goal is to obtain information about users of some websites.
- **Adding and changing the information in database:** the attacker inserts such SQL code that enables him adding arbitrary information or changing the information in the database.
- **Performing 'Denial of service' attack:** with this type of the attack the aim is to crash the database and with that preventing the operation in database for other users. The attacker doesn't have to destroy the whole database to perform this kind of an attack, it is enough to disable the access to the database for other users.
- **Remote execution of commands:** the attacker executes arbitrary commands in the database. Most commonly it is about pre-stored or saved procedures that are available for the certain users.
- **Increasing the authority:** by inserting the SQL code the attacker wants to increase his rights on the system which he can use for further attacks.

3. SQL injection in the fields for data input

SQL injection using the field for data input is the most known form of the attack. There are many examples that explain how to perform the attacks. If there is no basic authentication of the data on the website which user inputs the attack can be performed by any non-professional attacker. The simplest example of this form of the attack is to bypass the legitimate login on the system. When you want to login, the user has to write his username and password in two fields for data.[4] The program then catches the number of signs which the user has written and stores them in two variables, example '*user'* and '*pass'*. Program uses the given data to create SQL query in order to check is there a user in the database with the given name 'user' and password 'pass'. Some databases contain a table of names 'Korisnici' that have the attributes (columns in the table) '*KorisnickoIme'* and '*lozinka*.'

SQL query is set as follows:

[3] https://oib.aidrs.org/novost/sql-injection, visited, 7 Jabuary, 2019

[4] Anley, C. (2002.), ADVANCED SQL INJECTION IN SQL SERVER APPLICATIONS, Next Generation Security Software Ltd., page 41.

```
query = „SELECT KorisnickoIme FROM tblKorisnici
WHERE KorisnickoIme = '„ + user + „'
AND Lozinka = '„ + pass + „'„
```

When the user wants to login on the system, he will write his username and password in the right fields for input. If the user writes *'MahirZ'* and *'password'* , for an example, as his user name and password the SQL query will be as follows:

```
SELECT KorisnickoIme FROM tblKorisnici
WHERE KorisnickoIme = 'MahirZ'
AND Lozinka = 'password'
```

However, if there is no authentication of the data that user has written, the attacker can use fields for data input in performing any kind of the SQL command. For an example, if the user writes in the fields for data input the following number of signs:

```
'  OR  '1'='1
```

The following SQL query will be made:

```
SELECT KorisnickoIme FROM tblKorisnici
WHERE KorisnickoIme = ' ' OR '1'='1'
AND Lozinka = ' 'OR , '1'=,1 '
```

Then what happens is that the database does not authenticate the username in the table, that the user has written, but authenticates the input '1' = '1'. Since this input is always true, the whole 'WHERE' part of the SQL query will be authenticated. That gives the result of returning the first row in the table 'tblKorisnici' and the user has successfully logged on the system as a user who was first shown in the table. The result of this attack by SQL injection code is a possible login of the attacker as someone else, legitimate user.[5]
Optionally, the attacker could have written different signs which would have the same outcome as a previous example:

```
' OR 'a'='a
" OR "a"="a
' OR ''='
OR 1=1
' OR 1=1
" OR 1=1
') OR ('1'='1
```

4. Gathering the information about the database

For a successful attack by SQL injection code, it is necessary to know certain information about the database which you want to attack. The most important information is the one about the database

[5]Fayo, E. S. (2005.), ADVANCED SQL INJECTION IN ORACLE DATABASES, BLACK HAT USA: TECHNICAL REPORT, Argeniss Information Security, Black Hat Briefings, page. 14.

structure, table names and the type of data for attributes in the tables. Gathering the information about database is the first step in performing a successful attack.

Attackers deliberately create the error message by SQL injection code which causes:

a) Syntax error - used for revealing parameters which are vulnerable on the attacks by SQL code injection,
b) Logical error – used for revealing table names and attributes,
c) Error because of the wrong type of the data – used for revealing types of the data which are used for certain attributes and certain names of attributes.[6]

In the next example there will be shown how message errors can be used for revealing the information about databases (Microsoft SQL Server). SQL query is made using the following programme code:

```
query = „SELECT Racuni FROM tblKorisnici
WHERE KorisnickoIme = ' '' + user + '' '
AND BrojKreditneKartice = ' '' + broj + '' ' ''
```

Therefore SQL query is made by joining sequences of characters (strings) and is stored in a variable query. Thereby in variable ‘user’ is a username and in variable ‘number’ there is a number of a credit card that the user has entered into the programme. Created SQL query is further forwarded to the database.[7] If the attacker assumes that the database is Microsoft SQL Server, instead of the credit card number he can enter following SQL code:

```
convert (int, (SELECT TOP 1 name FROM sysobjects WHERE xtype = '
u '))
```

SQL query that is created by inserting the SQL code from above is as follows:

```
SELECT Racuni FROM tblKorisnici
WHERE KorisnickoIme = ' '
AND BrojKreditneKartice = convert (int, (SELECT TOP 1 name FROM
sysobjects WHERE xtype = ' u '))
```

When processing this query, the first user table (xtype = ‘u’) is trying to be reached from the meta data table which is called ‘sysobjects’ (because it is a Microsoft SQL Server database, the attacker can be sure, that is the table name). When the table is reached, then it is tried to be converted in type of a whole number. Since this is not possible, there is an error in converting the types and the following error is occurred:

> Microsoft OLE DB Provider for SQL Server (0x80040E07) Error converting nvarchar value 'KreditneKartice' to a column of data type int.

Attacker gets two important information from this message:

a) First, he gets the proof that it really is Microsoft SQL Server database. The whole attack is performed on the assumption that the whole time we are talking about Microsoft SQL

[6]Fayo, E. S. (2005.), ADVANCED SQL INJECTION IN ORACLE DATABASES, BLACK HAT USA: TECHNICAL REPORT, Argeniss Information Security, Black Hat Briefings, page. 15.
[7]San – Tsai, S., Ting, H. W., Stephen, L. (2007.), CLASSIFICATION OF SQL INJECTION ATTACKS, University of British Columbia: Sheung Lau Electrical and Computer Engineering, page. 27.

Server database, and after this error message, the attacker can be sure that his assumption was correct.

b) Second thing that the attacker has revealed is the name of one of the tables in database, in this case, the 'KreditneKartice' table name.

5. Conclusion

The attack by SQL injection code represents a great threat for any website which uses databases. Many websites have been attacked in this way and some of the most known websites like Microsoft or MySQL websites we not spared from these attacks. With these attacks it is possible to reveal some sensitive data, change the existing data in database or destroy the whole database. The attacker can even cause damage to the operating system. Introducing the basic authentication of the user inputs, like checking the existence of quote signs, full stop – coma signs or SQL key words, for most of the malicious users it gets harder to attack and they give up. For additional safety, it is necessary to make some changes in the database or server. Such changes are highly recommended because the damage caused by the attack can entirely destroy the website and the database. As in all security flaws, it is necessary to constantly monitor the security of the system. It is not enough to make changes once and assume that the website is well protected. The attackers are more and more skilful and imaginative and therefore the administrators of the databases have to upgrade their system all the time, so the system would be resistant on the SQL injection code attacks.

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Review paper / Pregledni rad

DEVELOPMENT OF AN EDUCATIONAL APPLICATION BASED ON AUGMENTED REALITY

Abstract

The research field of this paper is an analysis of the possibilities of applying the augmented reality in e-education. The application of augmented reality, mobile and Internet of thing (IoT) technologies facilitates the e-learning process. This paper presents a model of e-education based on augmented reality. As support for e-learning in the field of Internet of things, an application was developed in the Unity environment. The developed application should help students to learn the Internet of things technologies using augmented reality. In this way, students are introduced to the hardware and programming language used to develop smart educational environments. The aim of this paper is to facilitate students' learning process and realization of laboratory exercises of Internet of things using augmented reality.

Keywords: *e-education, augmented reality, Internet of things, smart educational environments.*

1. Introduction

Many organizations and institutions are using e-learning because it can be as effective as traditional training at a lower cost. Developing e-learning is more expensive than preparing classroom materials and training the trainer. However, delivery costs for e-learning are considerably lower than those for classroom facilities, instructor time, participants' travel and job time lost to attend classroom sessions.
E-learning reaches a large target audience by engaging learners who are:

- geographically dispersed with limited time and/or resources to travel;
- busy with work or family commitments;
- restricted in their mobility because of security reasons;
- limited because of cultural or religious beliefs;
- facing difficulties with real-time communication

Instructional methods of e-learning are very effective, such as practicing with associated feedback, combining collaboration activities with the self-paced study, personalizing learning paths based on

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learners' needs and using simulation and games. There is no dependence on a specific instructor, so all learners can receive the same quality of instruction. (Food and Agriculture Organization of the United Nations, 2011).The aim of scientific work is to facilitate the process of learning the technologies of the Internet of things, using the methods of e-learning. This involves the preparation of materials, their delivery, monitoring students' progress, accentuating support for controversial subjects and testing students. Internet of Things is one of the courses of the Department of Electronic Commerce at the Faculty of Organizational Sciences. The aim of the course is to introduce students to IoT concepts, applications, and technologies themselves. One approach to teaching IoT is to use its simulation tools to simulate devices or environments in which will be set up. (Milutinović et al., 2014)The application, which will be presented in the next chapter of the paper, visually presents different hardware components and teaches students how to connect them and make an applicable whole. The very luxury of a real-world view of these components gives us an augmented reality. The selected environment for developing an e-learning support application using the expanded reality is Unity. It, by itself, is not sufficient to create an augmented realit but requires the installation of additional resources. One of the better options is Vuforia, which was used in the implementation of the application presented in the paper.

2. Related work

2.1.E-learning

E-Learning is different from conventional face-to-face classroom teaching. It is a modern, technology-based, way of teaching and learning. (Bhandari, 2019) E-learning classrooms possess the equipment and technology to support blended learning. Blended learning is a combination of the traditional face to face system of learning and the virtual, offsite approach, creating a flexible and motivating environment. (Petrović et al., 2017) Nowadays, building an e-learning ecosystem is quite a cumbersome endeavor, as it implies the integration of various technologies, platforms, and services. (Radenković et al., 2014).

E-Learning is not learning directly from lecture notes, books or face-to-face from the teacher but through electronic means. Common forms are computer-based and web-based lessons. Lessons may be taken anytime anywhere. These lessons can be made more interesting using multimedia i.e. a combination of text, graphics, sound and animation. E-learning can be further categorized into formal lessons, which are structured, and informal means e.g. discussions, e-mail, etc.

Benefits of E-Learning:

- Multiple Delivery Options
- Just-in-Time Training:
- Administrative Control and Reporting
- Engaging and Effective
- Assessment
- Increased Productivity
- Lower Cost (Bhandari, 2019)

2.2.Internet of things

The expression "Internet of Things" describes the existence of a number of various things or objects like tags, sensors, actuators, mobile devices, capable of cooperating in order to achieve a common goal. (Bogdanović et al., 2014) Internet of Things (IoT) enables the things/objects in our environment to be active participants, i.e., they share information with other stakeholders or members of the network; wired/wireless, often using the same Internet Protocol (IP) that connects the Internet. Things/objects can independently recognize events and changes in their surroundings and act and react autonomously largely without human intervention in an appropriate way. A thing in the

internet of things can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low or any other natural or man-made object that can be assigned an IP address and is able to transfer data over a network. (IoT Agenda, 2019). The growth of interconnected things is expanding, and they use wireless and 2G/3G/4G mobile networks and 5G in the future. (European research cluster, 2015). The fundamental characteristics of the IoT are as follows:

1. Interconnectivity: Anything can be interconnected with the global information and communication infrastructure.
2. Things-related services: The IoT is capable of providing thing-related services within the constraints of things, such as privacy protection and semantic consistency between physical things and their associated virtual things.
3. Heterogeneity: The devices in the IoT are heterogeneous as based on different hardware platforms and networks. They can interact with other devices or service platforms through different networks.
4. Dynamic changes: The state of devices changes dynamically. Examples are sleeping and waking up, connected and/or disconnected as well as the context of devices including location and speed.
5. Enormous scale: The number of devices that need to be managed and that communicate with each other will be at least an order of magnitude larger than the devices connected to the current Internet.
6. Safety: Both the creators and recipients of the IoT, we must design for safety. This includes the safety of our personal data and the safety of our physical well-being.
7. Connectivity: Connectivity enables network accessibility and compatibility. Accessibility is getting on a network while compatibility provides the common ability to consume and produce data. (K Patel and M Patel, 2016)

The architecture of Internet of Things: Implementation of IoT is based on an architecture consisting of several layers. The layered architecture is to be designed in a way that can meet the requirements of various industries, enterprises, institutes, governments, etc. The functionalities of the various layers are discussed briefly in the following:

- Edge layer: this hardware layer consists of sensor networks, embedded systems, RFID tags and readers or other soft sensors in different forms. These entities are the primary data sensors deployed in the field.
- Access gateway layer: the first stage of data handling happens at this layer. It takes care of message routing, publishing and subscribing and also performs cross-platform communication.
- Middleware layer: this is one of the most critical layers that operate in bidirectional mode. It acts as an interface between the hardware layer and the application layer. It is responsible for critical functions such as device management and information management and also takes care of issues like data filtering, data aggregation, semantic analysis, access control, information discovery.
- Application layer: this layer at the top of the stack is responsible for delivery of various applications to different users in IoT. The applications can be from different fields such as: manufacturing, logistics, retail, environment, public safety, healthcare, food, drug, etc. (Bandyopadhyay and Sen, 2011)

2.3. Augmented reality

Augmented reality (AR) is a live direct or indirect view of a physical, real-world environment whose elements are augmented by computer-generated sensory input (Ristić et al., 2015). The Augmented Reality (AR) is a relatively new, but still large area. AR is a highly anticipated and unused niche. There are very few applications that implement AR technology on the Android market now. The Augmented Reality (AR) and Virtual Reality (VR) are the fields for which the difference is unclear. In other words, VR can be conceived as precursor AR, with some parts that overlap in both. VR does not use feed cameras and that us the main difference. All the things displayed in VR are either animations or previously recorded movie bits. We could tell that VR creates virtual worlds only, but AR joins real and virtual worlds.AR is rapidly growing in popularity because it brings elements of the virtual world, into our real world. When compared to other reality technologies, augmented reality lies in the middle of the mixed reality spectrum. (Reality Technologies, 2019).Despite being a relatively new field, there are enough AR apps available to allow us to make categories out of them. We will take a look at what has already been implemented in the world of AR. AR applications are usually using the accelerometer and the GPS to obtain location and the physical state of the device. These apps are meant to be enjoyed and useful. One of the winning apps of the Android Developer Challenge 2 was an AR game: SpecTrek. It uses GPS of your device to find your location and then prepares ghosts for you to hunt in surrounding areas. The game also has a map on which ghosts are displayed as markers on a Google map. During gameplay, the ghosts are added as an overlay over the camera image. Navigation apps have code to recognize roads and turnings and mark out the route with arrows. This is not an easy process as it sounds, but is often done today. World browsers are probably the most complex of all the casual apps that are widely used. They need several back-end databases and a lot of on-the-spot information from several sensors. Almost every app you see on the market looks simple at first sight. But if you delve into the code and back ends, you will realize that most of them are in fact, very complex and take a long time to develop.

The best examples of casual AR apps are SpecTrek and Wikitude. Together, these apps make use of practically everything you can use to make an AR app on the Android platform (Sood, 2012). The selected environment for developing an e-learning support application using the expanded reality is Unity. It, by itself, is not sufficient to create an expanded reality, but requires the installation of additional resources. One of them is Vuforia, which was used in the implementation of the application presented in the paper.

2.4.Unity

Unity is a 3D game authoring tool for Mac and PC. Unity Editor offers many tools, so most of the development stages are available in it. Unity tools:

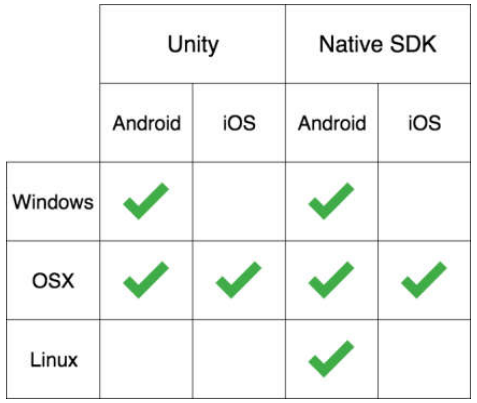
- All-in-one editor – available for Mac and Windows users. Easy to create an amazing game world without special technical knowledge.
- 2D and 3D - Supports both 2D and 3D graphics.
- AI pathfinding tools – It has a very smart navigation system, which serves to create NPCs with excellent ability to orient in the game world.
- Efficient workflows – Unity owns a special type of Game Objects named Prefabs. They are reusable and flexible components which reduce errors.
- User interfaces – Unity has a built-in UI system which is very artistic-friendly.
- Physics engine – provides highly realistic and high in performance gameplay.
- Custom tools – a developer can build his own extension for Unity and make it even simpler to use. There are many custom tools available on Unity Assets Store.
- Better Collaboration – great games are very rarely made by a single developer, so team collaboration is crucial. (Unity, 2019)

Unity support 25+ platforms where a user can deploy his application and reach a large audience.

2.5. Vuforia

Vuforia is a platform for the development of applications based on augmented reality. It uses a camera image to recognize images and 3D objects in real time. Image recognition algorithm proved to be one of the fastest. A key thing for beginners is a very intuitive interface. Vuforia is, within certain limits, a free development tool (Chapagain, 2018). Vuforia is widely known as the industry leader in industrial augmented reality through its best-in-class computer vision technology, robust tracking capabilities and breadth of platform support (PTC, 2019). For the development of augmented reality-based applications, it's not necessary to use Unity. Figure 1 shows development options with Vuforia:

Figure 1: Vuforia development options



Core features of Vuforia are:

1. Model Targets
2. Ground Plane
3. Image Targets
4. VuMark
5. Object Recognition
6. Cylinder Targets
7. Multi Targets
8. User Defined Targets
9. Cloud Recognition
10. Text Recognition
11. Virtual Buttons (Vuforia engine developer portal, 2019)

In this paper, Image Targets and Virtual Buttons will be used. Vuforia has ARCamera object which loads a picture, recorded from the camera, and calls algorithm to recognize the targeted. In our case, that target will be an image. Virtual buttons can be placed to the image and will activate when changes are detected in the area of the image where they are placed.

3. Designing an educational application based on an augmented reality

3.1. Modeling the Architecture of our system

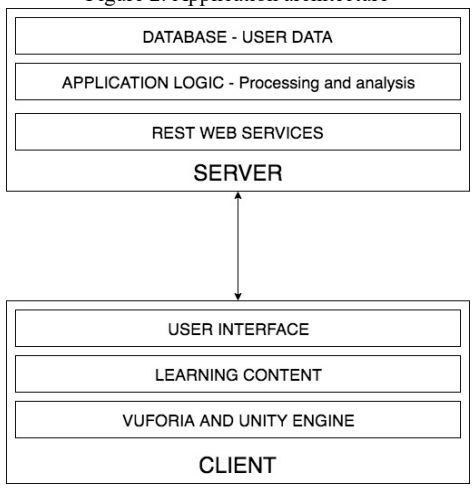
The application architecture consists of a server and a client component, and they consist of:

1. Client
    a. 3D models

   b. Vuforia framework
   c. Unity engine
2. Server
   a. Database
   b. API for client applications
   c. Data processing and analysis services

The architecture is represented graphically in the following figure 2:

Figure 2: Application architecture



The client side is in charge of the following:

- Easy and efficient navigation through the application
- View the lessons and materials that apply to each of them
- Test students knowledge
- Statistics that give the student an insight into the progress he has made
- Communication interface with both the professor and other students
- Collecting user data

The client side is designed so that the internet connection is not necessary for use. The student is not obligated to use the additional functionality the server offers, but in order to achieve the full potential of the learning process, this is recommended. Our system is designed to be adaptive. An e-learning system is considered to be adaptive if it is capable of:

- monitoring the activities of its users;
- interpreting these on the basis of domain-specific models;
- inferring user requirements and preferences out of the interpreted activities, appropriately representing these in associated models;
- acting upon the available knowledge on its users and the subject matter at hand, to dynamically facilitate the learning process. (Radenković et al., 2009)

The server side is in charge of the following:

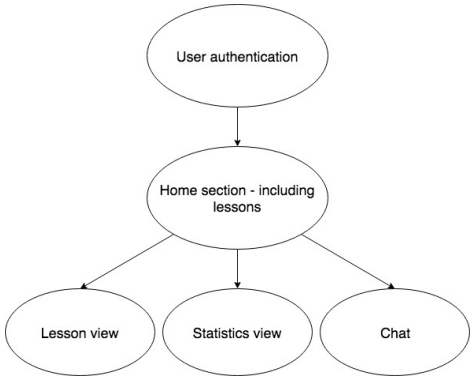
- Rest service to communicate with the client
- The process of analyzing data collected from the client
- Customer communication support
- Receiving feedback to the student
- Informing professors about students

The server side provides an additional set of functionalities so that the e-learning process itself can be completed. In addition to allowing the client to see his progress, the server gives him additional information, the purpose of which is to maintain the quality of learning. Students are collectively and individually analyzed on the server and these data are sent to the professor. The professor is here to provide support to students, and for that, a special channel of communication is foreseen.

3.2. Designing and implementation of the client application

This part of the paper will show the design of a complete client application, as well as the implementation of the e-learning part of IoT. Figure 3 shows the components of the application:

Figure 3: Application components



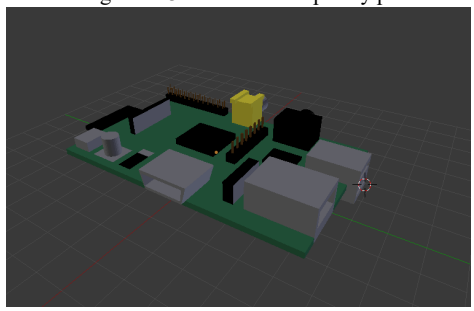
User authentication – This part is necessary because it is possible to use the same device by more students. The student logs in with the previously obtained data and, after verification, gets access to the Home section. Home section – This is a central section that lists all available lessons in it. She runs it all the other sections. By selecting one of the lessons, the student moves to Lesson view. Lesson view – To use this section, the application must have access to the camera. The resulting shot uses Vuforia and detects the predefined surface on which the teaching materials are displayed. The main part of these materials is 3D models, whose insertion into a real image creates an altered reality. Statistics view – Represents a graphical representation of data obtained from client and server applications. Chat – Section for communication between professors and students.

The implementation of the client application consists of the following steps:

1. Preparation of teaching material
2. Creating a user interface in the Unity environment
3. Connecting Unity and Vuforia
4. Create C # scripts for the functioning of the Lesson view.

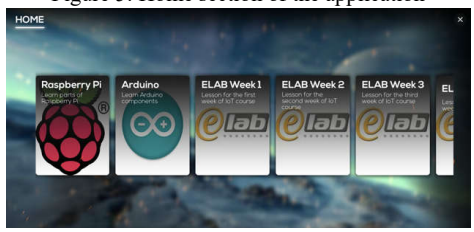
A key part of the teaching material is 3D models, necessary for the visualization of IoT components. The selected 3D modeling software is Blender. The following figure 4 shows the 3D model that represents Raspberry Pi:

Figure 4: 3D model of raspberry pi



When creating a user interface, some of the components from the Filed UI menu, available on Unity Asset Sore, were used. Figure 5 shows the Home section, which shows the available lessons:

Figure 5: Home section of the application



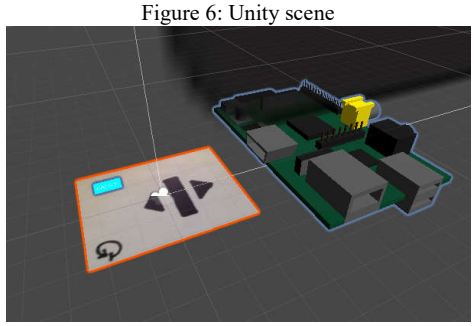
Each of the cards shown leads to Lesson view and launches a new lesson. The first card will display the previously mentioned Raspberry Pi device.

The next step is the implementation of an augmented reality. In order to do this, we will use Vuforia. The first step is to create an account on the Vuforia official site and then the database. In this case, we put an image that Vuforia will detect on the camera. In the unity, we enter the license key, obtained from the site. After that, we remove the base and import it into Unity.

Unity uses the Camera object for rendering images. With Vuforia, this is a bit different, because it uses the Augmentet Reality Camera object, which accesses the device's camera and makes a realistic view. By detecting the image, which we inserted into the database, Vuforia continues to execute the specified commands. In our case, it is a 3D model view, as well as components to display the textual material of the lesson.

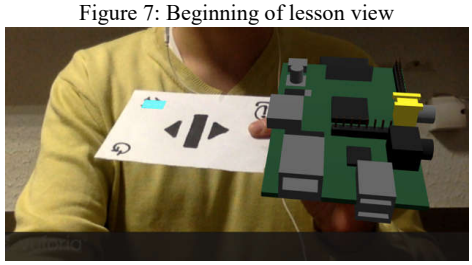
For a better experience of augmented reality, we will use virtual buttons, instead of the standard unity in and button components. The virtual button is positioned as well as the 3D model, relative to the image being detected.
Figure 6 shows the unity of the scene where we added the picture for the deck, the 3D model and the virtual button:

Figure 6: Unity scene



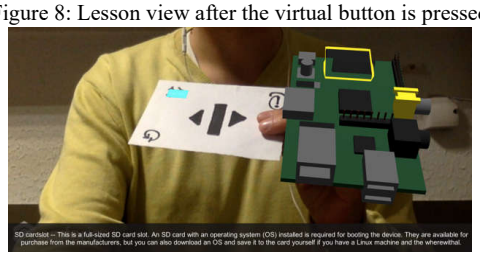
By clicking on the virtual button, one component of the raspberry pi device is labeled, and in the horizontal panel, at the bottom of the image, the text that is being sent is displayed. It is implemented within the C # script virtualButton.cs. Figure 7 shows the Lesson view for the raspberry pi lesson:

Figure 7: Beginning of lesson view



Clicking the button marks the first component and a description appears, as in figure 8:

Figure 8: Lesson view after the virtual button is pressed



Back to the Home view, you can select the next lesson. The statistics are intended to monitor the student's progress by inspecting the lessons learned and the test results.

4.Conclusion

Our application has game-like feel because games can easily attract players attention. Over 20 years scientists have used video games as a means of research on the basis of that, they concluded that games could be educatively useful (Petrović et al., 2017). A key part of the client application is presented in this paper. Some of the envisaged functionalities are not implemented, because without a server application they make no sense.The plan is to implement a server application that, in addition to data analysis and communication support, will allow the professor to set up new lessons and tests through rest web services (Despotović-Zrakić et al., 2015). At the same time, it is desirable to have another type of client application, which will use the above services, intended only for professors. It would be implemented as the Content Management System.Although there are many more planned implementation units, the goal is achieved, which is the creation of a client application that teaches students IoT components using augmented reality and e-learning.

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Dino Arnaut, Assistant Professor[1] *Preliminary communication / Prethodno saopštenje*

SHAPING LEARNING THROUGH TECHNOLOGY FORESIGHT

Abstract

The technology will have a great role in shaping the future of education. To determine future of education by trying to get an insight how technology is shaping and will continue to shape learning. To attract corporate partnerships, institutions will need to demonstrate a commitment to advanced technologies. Therefore, academic partnerships will become an increasing part of the university experience. There will also be a rise of science/technology centres that will have ability to improve and enhance learning process and knowledge transfer more than online learning methods if properly managed. These changes will have a significant ripple effect on education. Advanced technologies will put education within the reach of many individuals all around the world, allowing them greater specialization in curriculum as well as teaching methodologies, leading to a challenge to support the adoption of technology on universities. Technology can be our friend but to gain its full benefits we must understand how it works. The concept of foresight started to dominate contemporary management discourse with a remarkable upsurge in the number of papers reporting a positive influence of foresight on innovation which became a starting point for theorizing the relevance of foresight in organizing.

Key words:*foresight, innovation, learning society, foresight methodologies, knowledge creation*

1. Introduction

In this past few years of global economic crisis, policy leaders around the world are starting to recognize more and more what the critical importance education have on economic competitiveness and to the creation of high quality of life for citizens. Learning becomes fundamental for the progress of humanity, from the economic prosperity and social well-being to the personal fulfilment. All of this is essential for ensuring the sustainable planet. We must realize that education is not isolated, it is not an island. Because of that education is affected by what is happening in the field as well as by what is happening in the rest of society. This paper examines ongoing and plausible emerging trends and explores how these may affect education over the next ten years.

It is very difficult to predict the future, and therefore in our everyday lives we constantly depend on a prediction that future will be like the present. Futurists often predict that potential changes will occur quickly in the short term and they are often too limited in predicting long-term changes. Limitation is the result of difficulty to think through the full range of unexpected side-effects that changes in one part of society cause in other parts. Also, futurist often ignore the institutional barriers to the change itself. As technology starting to play a larger role in education, any predictions concerning the future of education must include an analysis of technological trends.

This paper has the purpose to do that, to analyse if we can successfully predict the future of technology and education, by analysing the trends in technology and how they relate to education with help of foresight methods. We will summarize methods used in technology foresight exercises from 2010 as a starting point today for testing applicability of foresight methods. Foresight methods are often used in exercises in combinations. It is therefore useful to know and understand the full range of methods available.

Future that is predicted in this paper might offend fervent supporters of our traditional educational system. However, it will become clear that as technology is being more and more adopted into

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education, and therefore the end result will be the *change*. That is why we, the educators, academics, must start thinking strategically about technologies, tools, and methodologies that will have the greatest impact on the way we prepare students for the 21st century. We need to ask ourselves, what will education be like in the year 2020 or even 2030? Technologies will give us possibilities, but they will not determine development of the future. This paper will explore some possibilities that could be enabled by technologies and that may have positive implications for education, and therefore to the society.

2. Education Today

For over a century, education has remained largely unchanged. Quality education is a universal goal. Arguments that instructional technology will be the key to educational quality as we enter the new millennium existed even in 1997 in work of Fiske and Hammond. Investment in educational technology is urged upon policy-makers as the path to educational quality (Mergendoller, 1996). Even then, an enthusiast for educational technology argued that quality has and will continue to increase rapidly, creating a so called "new educational culture" (Connick, 1997). Whatever problems exist are ones which can be handled through better administrative and technological planning. This means that technology believers perceive no intrinsic obstacles to total quality assurance using information technology in higher education (Roth & Sanders, 1996).

Alfred Bork[2], an educational technology guru, in 1999 was interviewed by Educom Review[3], where he set forth several aspects of his vision of *the future of education* (Educom Review, 1999):

- Education will become highly interactive, engaging the student every 20 seconds or so for a response, much in contrast to present-day passive lecture methods.
- Education will become highly individualized, with world-accessible records of learning attempts by students, to enable computer presentation of education tailored for each student's past learning experiences and styles.
- Education will become highly flexible in interaction, enabling natural-language tutoring using the Socratic method of tutorial question and student response.
- Education will become highly accessible, opening opportunities for the disadvantaged in this country as well as for the millions in developing nations.
- Education will become highly computer-mediated, replacing (not supplementing, which would be an added cost) the lecture method in courses for 15 or more students.
- Distance education will begin to displace campus-based education because the high costs of an interactive computer-mediated course can be justified only through their use by many students than only distance education can provide.

Bork is hardly the only technology spokesperson who believed that computer-mediated distance education will spell the end of the traditional university as we know it. George Mason University's Peter Denning made such an argument before the National Science Foundation, basing himself on four arguments (Denning, 1997):

- The library as a physical place is soon to be replaced by digital libraries accessible worldwide by almost anyone.

[2] Alfred Bork headed the Association for Computer Machinery's Special Interest Group on Computer Uses in Education for years. HE also advised on this subject for the National Institute of Education and have been named Outstanding Computer Educator by the Association of Educational Data Systems.

[3]The journal of EDUCAUSE (formerly EDUCOM), the leading association of colleges and universities for the advancement of educational technology.

- The “community of scholars” around the library is soon to be replaced by communities of specialists linked electronically, divorced from geographical location.
- The ideal-typical small undergraduate class has become unaffordable and cannot compete with commercially-provided education on the same subjects, such as computer science, nor can universities compete with commercial courses’ glitz and entertainment production values.
- Job structure has changed such that universities can no longer hope to prepare students for or promise them a “lifelong career”, the central selling point of higher education until recently.

Classrooms full of students deferring to the wisdom of an *all-knowing professor* has, is, and probably will continue to be the accepted mode of instruction. Most today’s classrooms continue to utilize this traditional mode, despite the introduction of new pedagogical concepts and many technological advances. Educators have created and thrived in a bubble immune from advancements in technology. Now, the increasing rate of change of these advances look to be threatening to burst this bubble. The importance of technology in education, whether it is its use to support teaching and learning, or to develop student capabilities, or even to support educational management, is now recognised throughout the world.

Many people warn of the possible harmful effects of using technology in the classroom. The questions start popping out:

Will children lose their ability to relate to other human beings or will they become dependent on technology to learn? Will they find and stumble upon inappropriate materials? Will they lose creativity? Will they fall behind instead of moving forward?

But all of this was probably said with the invention of previous technological achievements such as the printing press, radio, and television. All these inventions/achievements can be used inappropriately, but, at the same time, all of them have given humanity unbounded access to information which can be turned into knowledge. Used interactively and with guidance, they have become tools for the development of higher order thinking skills. Inappropriately used technology can be used to perpetuate old models of teaching and learning.

Nowadays, students can be “plugged into computers” to do drill and practice that is not so different from workbooks, and teachers can use multimedia and information technology as well as Web to give more colourful and stimulating lectures. All of these have their place, but such use does not begin to tap the power of these new tools that are emerging and that will emerge in a years to come. The world now is getting smaller and bigger at the same time. Our world shrinks since now technologies allow us to communicate both synchronously and asynchronously with peers around the world, and, conversely, the explosion of information that is now available to us expands our view of the world.

We can conclude that because of the information explosion and the ability to communicate globally, education must change. Even educators might not want to change, the change is still coming. It is a matter of when not if.

The *Big Challenge* is to prepare the children of today for a world of tomorrow, a world that has yet to be created, for jobs yet to be invented as well as undreamed technologies. As we will see, the driving forces of Moore’s Law, Metcalfe’s Law, technology fusion and Gartner’s Hype Cycle are redefining the way student need to be taught. The current teaching paradigm of the teacher as the possessor and transferor of information is shifting to a new paradigm, a paradigm where teacher has a role of a facilitator or coach. This new teacher will provide contextual learning environments that will engage students in collaborative activities. Those activities will require communications and access to information that only technology can provide.

Today's students relay very heavily on electronic devices even when they're not incorporated in the classroom. In one survey of college students, 38% said they couldn't even go 10 minutes without switching on some sort of electronic device. On the other side, questions like how students are using their devices, or how technology is affecting their educational experience, and what effect it has on their well-being are harder to answer.

While it is not much of a secret that students are addicted to technology, the specifics of their gadget usage have never been studied scientifically until now. Even though dependence on technology might be alarming[4], the good news is that much of their screen time is spent on learning.

It is obvious that education is slow to change, especially in department of incorporating new technologies. Jukes and McCain (1997) describe this as *paradigm paralysis*, the delay or limit in our ability to understand and use new technology due to previous experiences. It takes time for new experiences to replace the old ones. Unfortunately, education can't take all the time it wants, since the trends in technology are creating a future that is arriving much faster than education is preparing for it. Therefore, we must pose a question - *what are these trends and how will education adapt to them?*

To answer these questions, the foresight methods can be used. But first, we will take a brief look at our past to formulate an understanding of the trends of today and to predict the trends of tomorrow more easily with help of foresight methods.

3. Trends of Today and Learning Society

To understand today's technological trends, we will look at how they have developed over the years. Computers have a long history even in education. For example, the ENIAC, built at the University of Pennsylvania's Moore School of Electrical Engineering between 1944 and 1946, was the first large-scale general-purpose electronic computer (Goldschmidt & Akera, 1998). It weighed 30-tons, contained 19,000 vacuum tubes, 1,500 relays, and consumed almost 200 kilowatts of electrical power (Weik, 1961). Designed to calculate trajectory tables for new guns, the ENIAC failed on an average of every seven minutes, but when it worked it could compute 10-digit multiplication in $3/1000^{th}$ of a second which was a huge accomplishment for its day (Jukes & McCain, 1997).

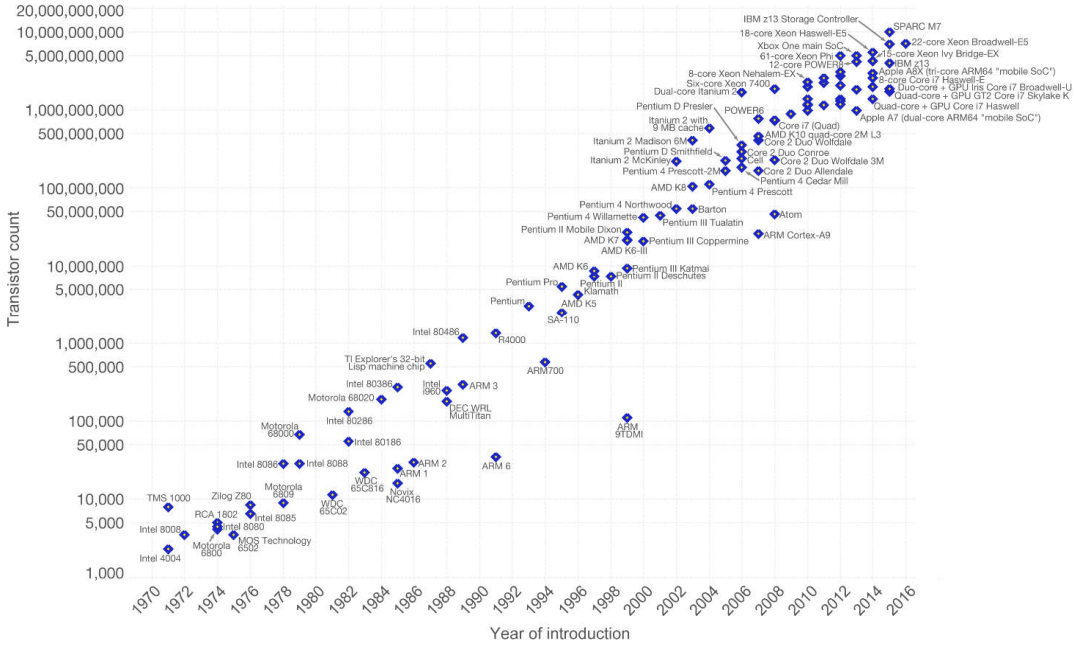
The 1980 model Cray supercomputer was the fastest machine of its day. It cost $12 million, weighed five tons, and consumed 150kW of electricity, it had only 8MB of RAM and operated at speed of 80 MHz (Jukes & McCain, 1997). By comparison, today a Smartphone that is far more energy efficient and with the capabilities that are more than 10 times better can be purchased for under $300.

We have become painfully aware of how quickly computers become outdated ever since the popularization of the desktop computer in the 1980s. Many of today's educators point to this trend in their argument against the use of computers. This trend has popularly become known as Moore's Law, named after Gordon Moore, the cofounder of Intel Corporation. In 1965 Moore suggested that technology doubled in processing power approximately every 18 months and at the same time the price for that technology declined by about 35% a year relative to this power. The accuracy of Moore's prediction has proven to be frighteningly accurate. The Figure 1.Illustrates the effects of Moore's Law from 1971 to 2016. In a 1993 speech, the Vice Chairman of AT&T, Randall Tobias, put Moore's Law in perspective when he said, *"...if we had had similar gains in automotive technology, today you could buy a Lexus for about $2. It would travel at the speed of sound and go 600 miles on a thimble of gas. It would be only three inches long... but easy to parallel park!"*(Tobias, 1993).

[4] A University of Maryland study asked students not to use media for 24 hours. As a result, a large percentage of the students experienced symptoms similar to drug and alcohol withdrawal.

Taking the reverse stance of education, business and industry have adopted the approach of staying up-to-date with technology. It appears that the current economy supports the notion that this approach is valid, and yet most schools and other educational institutions continue to adopt the approach of remaining several technological generations behind industry and business.

Figure 1. Moore's Law – The number of transistors on integrated circuit chips (1971-2016)



Source: Data have been updated by OurWorldinData based on highest transistor count

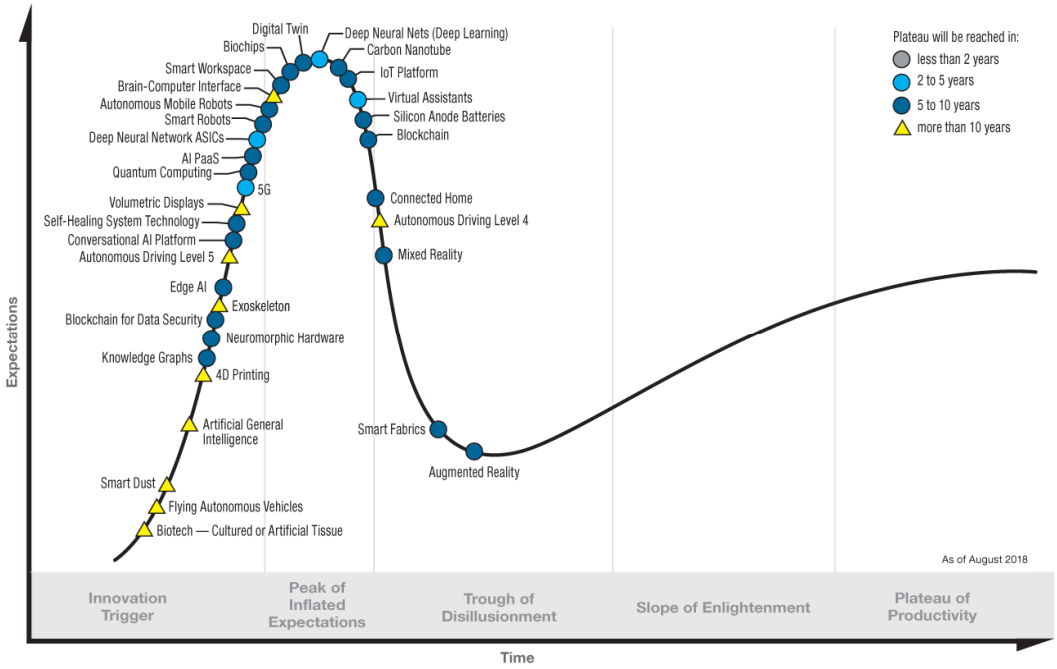
As the power of the computer increases, so do the capabilities of communications media (including glass fibres, copper wires, and wireless communication systems). The combination of better, cheaper computers and increased bandwidth has caused a boon in the network community (i.e. the Internet). Inventor of the Ethernet, Bob Metcalfe, suggested that the power of a network increases proportionally by the square of the number of users.

Like Moore's Law, over time this has become known as Metcalfe's Law and has played a major role in shaping the business world, and it affected education as well. In layman's term Metcalfe's Law means that the more people that are connected to a network the more powerful that network becomes. So, as millions connect to the Network of networks (the Internet), the power of sharing information and ideas grows. And since education is in the business of sharing information and ideas Metcalfe's Law becomes a force that will plays a major role in shaping the institution in the years to come.

Another event that has a significant impact on education is technology fusion. Thirty years there were sharp distinctions between computers, photos, publishing, TV/video, and telecommunications. Throughout the years the distinctions between these media faded, and now there are virtually no distinction between them. Through the last decade new technologies emerged and became fused with coexisting ones. The result of this fusion is the manufacturing of computers and devices that can perform all the functions that few decades ago needed separate devices.

The Education Coalition[5] considers the merger of computing, television, printing and telecommunications as the most significant trend in education and technology. *"Bringing them together results in the whole having greater impact than each individual part..."* (Lane & Portway). A *hype cycle* is a graphic representation of the maturity, adoption and social application of specific technologies (Fenn, 1995). The term was coined by Gartner[6].

Figure 2. Hype Cycle of Emerging Technologies in 2018



Source: Adapted from Gartner (August 2018)[7]

Gartner Hype Cycles provide a graphic representation of the maturity and adoption of technologies and applications, and how they are potentially relevant to solving real business problems and exploiting new opportunities. Each Hype Cycle drills down into the five key phases of a technology's life cycle:[8]

- ***Technology Trigger***: A potential technology breakthrough kicks things off. Early proof-of-concept stories and media interest trigger significant publicity. Often no usable products exist and commercial viability is unproven
- ***Peak of Inflated Expectations***: Early publicity produces a number of success stories, often accompanied by scores of failures. Some companies take action; many do not.
- ***Trough of Disillusionment***: Interest wanes as experiments and implementations fail to deliver. Producers of the technology shake out or fail. Investments continue only if the surviving providers improve their products to the satisfaction of early adopters.

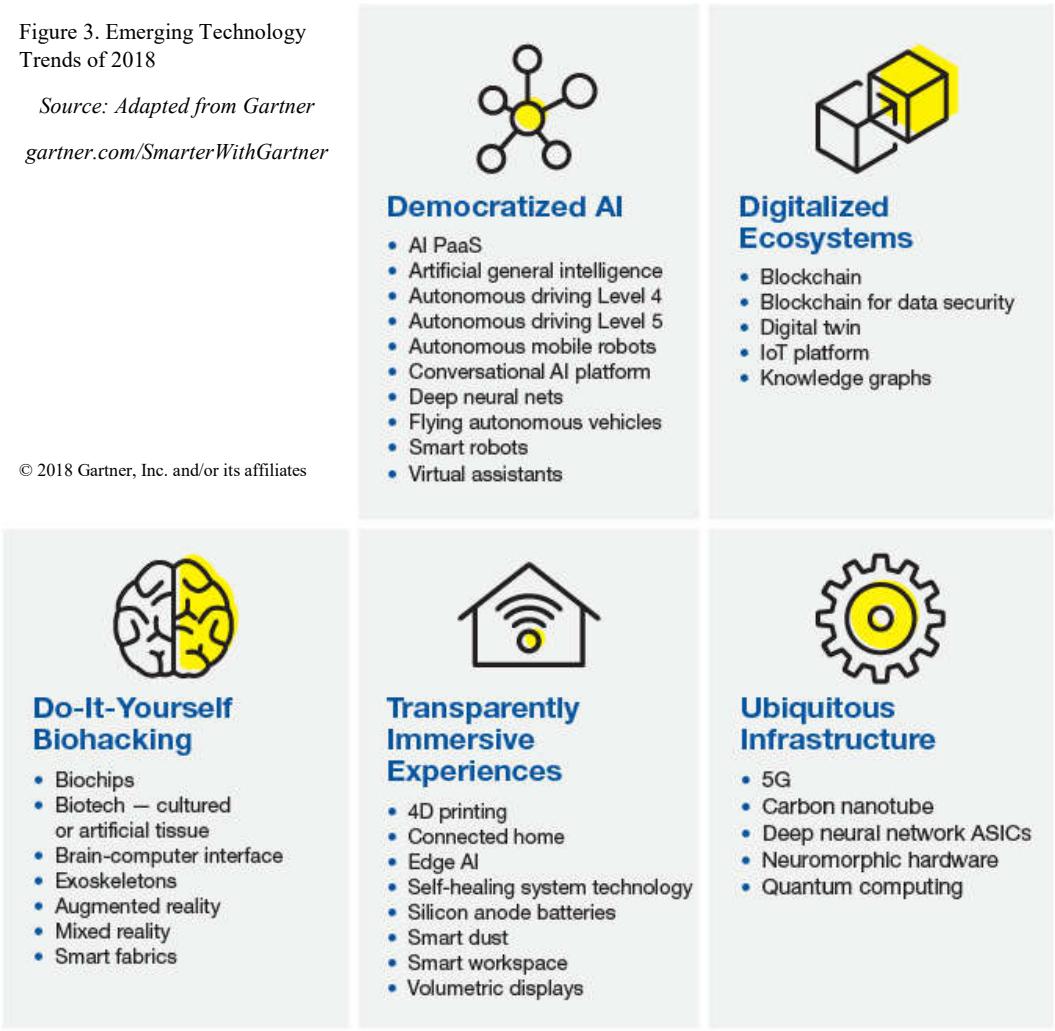
[5]**The Education Coalition (TEC)**, a non-profit agency, is the leader in innovative web-based training courses designed to appeal to multiple intelligences and learning styles. [http://www.tecweb.org/]
[6]**Gartner**, Inc. is an information technology research and advisory firm headquartered in Stamford, Connecticut, United States. It was known as **GartnerGroup** until 2001. Gartner delivers the technology-related insight necessary for its clients to make the right decisions, every day. [http://www.gartner.com/technology/home.jsp]
[7]https://www.gartner.com/smarterwithgartner
[8]https://www.gartner.com/smarterwithgartner

- ***Slope of Enlightenment***: More instances of how the technology can benefit the enterprise start to crystallize and become more widely understood. Second- and third-generation products appear from technology providers. More enterprises fund pilots; conservative companies remain cautious.
- ***Plateau of Productivity***: Mainstream adoption starts to take off. Criteria for assessing provider viability are more clearly defined. The technology's broad market applicability and relevance are clearly paying off.

Figure 3. Emerging Technology Trends of 2018

Source: Adapted from Gartner

gartner.com/SmarterWithGartner

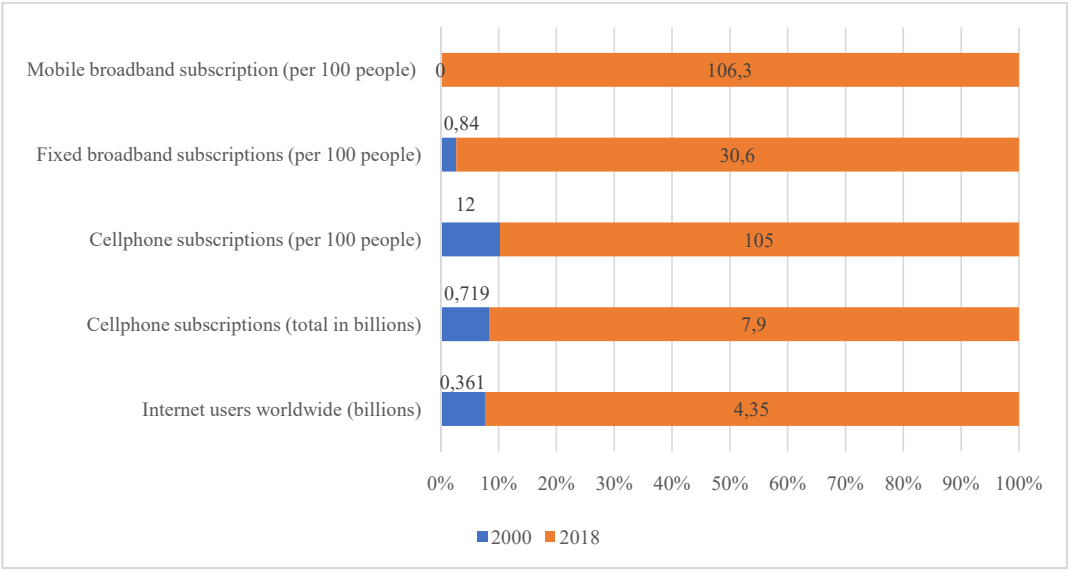


According to Gartner (see Figure 3), transformational technologies that will hit the mainstream include democratized AI, digitalized ecosystems, do-it-yourself biohacking, transparently immersive experiences and ubiquitous infrastructure. Gartner Hype Cycles present a good foundation and information that will help during foresight and give better insights in popular emerging technologies.

Education main responsibility should be preparing of its students to be contributing members of the society, that is to the world economy. Therefore, in a consideration we must always take type of an economy in which these students will be entering as well as changes and trends that are ongoing or on the verge of an emergence.

It's hard to believe how much the world has transformed in the past decade. Technology has gotten unimaginably smaller and better and the costs of technology are becoming more apparent than before. The important changes in technology in last decade are given in Figure 4. Data given in Figure 4.Are really speak for themselves. It implies how world became more connected following previously described Metcalfe's Law and other technological improvements.

Figure 4. Technology 2000 vs. 2019



Source: OECD, United Nations, Internet World Stats, World Bank.

Learning is fundamental for the progress of humanity (economic prosperity, social well-being, personal fulfilment, and to help ensure a sustainable planet). Learning society is an educational philosophy advocated by the OECD and UNESCO that positions education as the key to a nation's economic development and holds that education should extend beyond formal learning[9] into informal learning centres to support a knowledge economy (Spring, 2009). A learning society regards the actual process of learning as an "activity, not a place"[10] This means that it takes place outside of regular educational institutions, and therefore is decentralized and deregulated, a tenet of globalization theory. Learning societies are broader in context, drawing on elements of systems to facilitate the ability for lifelong learning in the individual. If lifelong learning is about the ability of the individual, then this is enabled through a Learning Society. Therefore, we can say that learning society is shifting learning itself from the wisdom of one towards the wisdom of many. This leads to creation of web of additional resources available outside traditional educational institution. This enables students to gather and acquire knowledge from different resources thus upgrading learning on a higher level. New technologies increase possibilities for learning throughout life, have the potential to improve access, and intensify and spread the process of knowledge creation, enable the creation of communities of connected learners of all ages without regard for geography. We can say that William Gibson was right when he said *the future is here, it's just not widely distributed*. New vision of learning emerges from this. Learning seen as an activity not a place, where it is wide open to new people with new ideas.Learners "pulling" learning toward themselves rather than teachers "pushing". Education and technology go hand in hand, with the network serving as the platform for what we call the Learning Society. In the future, learning will become substantially more important to every part of global society.

[9] Formal learning is based in traditional educational institutions such as schools, universities, etc.
[10] The Learning Society, Cisco Whitepaper, Cisco Systems Inc. (2010).

4. Foresight

Foresight has its roots in the futures research discipline. The term "future research" is used as a term to describe the whole range of research conducted to help organizations, individuals, and governments explore, prepare for, and respond to changes in the environment. The term foresight is used to differentiate against forecasting which predicts the development of a known trend or issue. Foresight, on the other hand, is aimed at identifying new emerging issues for which often no past data is available and therefore forecasting would not be possible (Krystek, 2007).

There are two popular definitions of foresight, both provided by UK-based researchers. The one that is mostly quoted is that from Ben Martin at SPRU[11]. He describes research foresight as "the process involved in *systematically* attempting to look into the longer-term future of science, technology, the economy and society with the aim of *identifying* the areas of strategic research and the emerging generic technologies likely to yield the greatest economic and social benefits" (Martin, 1996). This process involves methods and techniques to gather, assess, and interpret relevant information and to support decision-making (Cuhls, 2003).

Similar definition is given by Luke Georghiou at PREST[12], who describes technology foresight as "a *systematic* means of *assessing* those scientific and technological developments which could have a strong impact on industrial competitiveness, wealth creation and quality of life" (Georghiou, 1996). Also, a closely related definition has been established by the FOREN Network: "Foresight is a systematic, participatory, future intelligence gathering and medium-to-long term vision building process aimed at present-day decisions and mobilising joint actions".[13] There are five important aspects to these definitions:[14]

Nowadays definitions of foresight are tending to place more emphasis on process benefits and system building. That is why, according to the FOREN Practical Guide to Regional Foresight, foresight involves five essential elements:[15]

- Structured *anticipation* and *projections* of long-term social, economic and technological developments and needs.
- *Interactive* and *participative methods* of exploratory debate, analysis and study, involving a wide variety of stakeholders, are also characteristic of foresight (as opposed to many traditional futures studies that tend to be the preserve of experts).
- These interactive approaches involve forging new social *networks*. Emphasis on the networking role varies across foresight programmes. It is often taken to be equally, if not more, important than the more formal products such as reports and lists of action points.
- The formal products of foresight go beyond the presentation of scenarios, and beyond the preparation of plans. What is crucial is the elaboration of a guiding *strategic vision*, to which there can be a shared sense of commitment (achieved, in part, through the networking processes).

[11] SPRU - Science and Technology Policy Research is the centre of a worldwide network of interdisciplinary researchers addressing the analysis of the rate and direction of scientific change and innovation, the promotion and management of innovation, the regulation of technological risks, the search for effective energy policies and paths to a more sustainable society. [http://www.sussex.ac.uk/spru/]

[12] The Policy Research in Engineering, Science and Technology (PREST) is an institute of the University of Manchester (UNIMAN) that carries out research and postgraduate teaching on the economic, political, social and managerial problems which affect or result from the development of science and technology. [http://www.mbs.ac.uk/prest/]

[13] FOREN - Foresight for Regional Development Network (2001): A Practical Guide to Regional Foresight, Sevilla: Institute for Prospective Technological Studies (IPTS), Sevilla, p. 3.

[14] UNIDO Technology Foresight Manual (2005): Organization and Methods, Vol. 1, Vienna, pp. 8-9.

[15] FOREN - Foresight for Regional Development Network (2001): A Practical Guide to Regional Foresight, Sevilla: Institute for Prospective Technological Studies (IPTS), Sevilla, p. 4.

- This shared vision is not Utopian. There has to be explicit recognition and explication of the implications for "*present-day decisions* and actions" (emphasis original).

Definition that is more flexible and captures key elements of the process that are usually neglected in some of the more commonly used formulations:

> "The foresight process involves intense iterative periods of open reflection, networking, consultation and discussion, leading to the *joint refining of future visions* and the *common ownership of strategies*, with the aim of exploiting long-term opportunities opened up through the impact of science, technology and innovation on society... It is *the discovery of a common space for open thinking on the future* and the *incubation of strategic* approaches..."[16]

This perspective avoids the treatment of foresight and its implementation as separate processes without serious attempts to build bridges between or to link the two, where particularly important is the stress placed upon the way in which joint foresight activities are linked to the joint formulation and ownership of strategies.

Foresight is often confused with other future-oriented activities, such as forecasting, futures studies, and strategic planning. Forecasters aspire for precision in their attempts to *predict* how the world might look at some point in the future, while foresight does not. Instead, foresight is a process that seeks to *create* shared visions of the future, visions that stakeholders are willing to endorse by the actions they choose to take today. That is why foresight is not concerned with *predicting* the future, but rather with *creating* it. The important thing to note is that foresight does not replace forecasting, futures studies, strategic planning or any other future-oriented activities. Each activity has its role, which in many instances can be mutually supportive (Keenan, 2003).

With regards to futures studies and strategic planning, Figure 5.Sets out their relationship with foresight. Here is important to note that foresight does not replace forecasting, futures studies, or strategic planning, but each of these activities has its role, which in many instances can be mutually supportive (Keenan, 2003).

Three primary sources of information on future methods are the five-volume collection Knowledge Base of Futures Studies (Slaughter, 1996-2005), the Futures Research Methodology 3.0 (Glenn & Gordon, 2004), and the special issue of Compass entitled The APF Methods Anthology (Curry A. (2015).

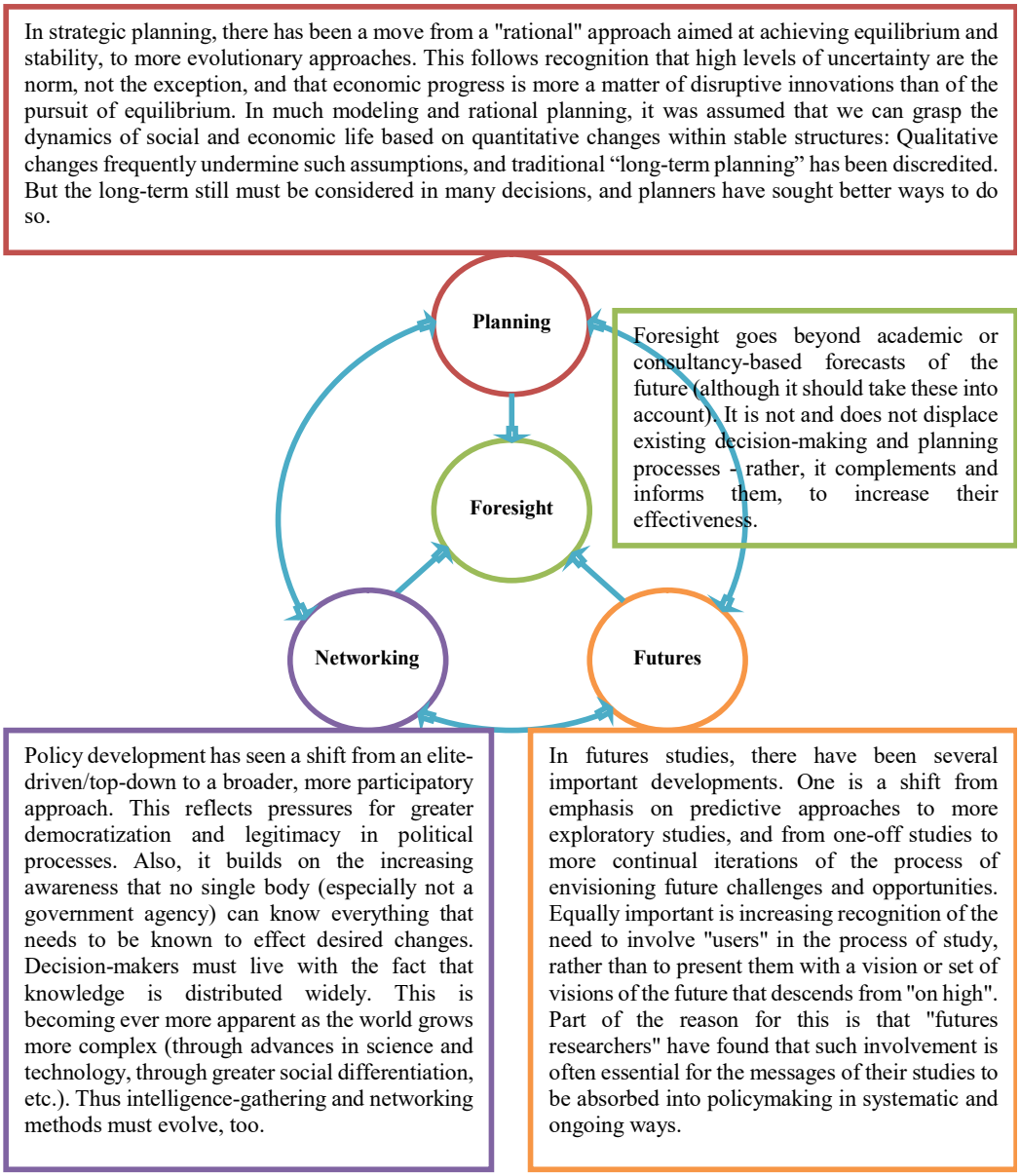
Foresight, forecasting or other future approaches are used as a part of the vision and strategy development for a long time (Keenan, 2003). They are used as a tool to systematically develop or adjust strategic plans. Looking at future developments these strategies can be adjusted to future characteristics and their contribution roughly is fourfold (EFMN 2009):

- **Support decision-making:** Providing an more quantitative information base as input for strategic decisions for investments or actions. Also a more process oriented approach can support the creation of commitment to a decision.
- **Ideation:** Inspire to new ideas, opportunities and providing information on possible new markets, policy measures, or other activities.
- **Increase of anticipatory intelligence:** Providing information on future developments, possible actions can be reflected against to increase the insight of their future context.
- **Create networks and mobilize stakeholders:** Creating a mutual mindset between possible partners around specific subjects, or even joint ventures.

[16]Jennifer Cassingena Harper, Malta Council for Science and Technology.

There are many tools, methods, approaches, activities used and organized in future studies. A wide range of methods are available, some are specifically designed for futures work while others are borrowed from management and planning. It is important that the chosen methods are selected as suitable for the purpose for which they are to be used. Exploring possible, probable and preferable futures relies on assumptions about the future and how we relate to it, which in turn will influence the choice of methods.

Figure 5. Positioning Foresight



Source: Adapted from Keenan (2003)

The literature offers several approaches to the classification of methods of thinking about the future. Finding the most appropriate methods may depend on accurately assessing the circumstances we

are in and the reasons for attempting to use them. The classification set out in Table 1. Shows the wide range of methods available for thinking about the future.

Table 1. A Classification of Futures Methods

Approach	Concept	Technique	Assumption
Foreseeing	Prediction	Precognition	Special ability
		Prophecy	
		Astrology	
		Genius forecasting	
	Extrapolation	Time series/trend forecasting	Pattern recognition
		S curve	
		Envelope curve	
		Precursor analysis	
		Cycles	
	Analytical forecasting	Casual models	Explanatory system
Managing	Judgmental	Delphi	Expert opinion
	Forecasting	Cross-impact	Interactions
	Management	Content analysis	Scanning
		Issues management	
		Environmental scanning	
		Impact assessment	Analysis
		Cost benefit analysis	
		Risk assessment	
		STEEP	
		Mind mapping	
		Causal-layered analysis	Questioning
		Role play	Dramatic representation
		Scenarios	Alternative futures
		Field-anomaly relaxation	
Creating	Policy-making	Problem solving	Rationality
		Decision-making	
		Planning	
		Strategy formation	
		Politics	Power
		Backcasting	Logical steps
		Relevance tree	
		Morphological analysis	
		Roadmapping	
	Speculation	Science fiction and speculative writing	Imagination
	Imaging	Brainstorming/Brainwriting	
		Group support systems	
		Futures workshops	
		Visioning	
		Incasting	
		Creative imagery	

Source: Adapted from May (1996)

This classification divides methods into three main types according to the approaches they take to the future (foreseeing, managing an creating). Some methods may bridge the main divisions or in different circumstances be based on different assumptions (May, 1996).

Foreseeing is the attempt to see the future before it occurs and is synonymous with words such as predict, prophecy, forecast, foresight, fore-knowledge. Such approaches assume predictability and that we can obtain knowledge before an event. They are therefore concerned with gaining advance information about the future.

Managingwhich accepts that the future is unpredictable and that we are not able to forecast with certainty. This approach focuses on managing change, which may be reactive, as in crisis

management or positive, as in strategic management or management by objectives. These methods focus on the uncertainty of the future and on ways of dealing with it.

Creatingassumes the future does not exist and has yet to be created and that the future is open to human influence and will depend in large measure on what we do. This approach is positive or proactive and focuses on the development of normative, desirable or preferable futures. Creativity is often thought to be a special ability of a limited number of individuals such as artists and designers, while others argue that we all have the ability to be creative but have not developed it. A special issue of Technological Forecasting and Social Change has been published on recent developments of morphological analysis (Ritchey & Arciszewski, 2018)

To make valid decisions, the selection of the right methods is essential. Popper describes two fundamental *attributes* of foresight methods, *nature* and *capabilities*. With regards to their nature, methods can be characterized as (Popper, 2008):

- **Qualitative methods** generally provide meaning to events and perceptions. Such interpretations tend to be based on subjectivity or creativity that is often difficult to corroborate, for example opinions, judgements, beliefs, attitudes, etc.
- **Quantitative methods** generally measure variables and apply statistical analyses, using or generating, at least in theory, reliable and valid data, such as socio-economic indicators.
- **Semi-quantitative methods** are basically those that apply mathematical principles to quantify subjectivity, rational judgements and viewpoints of experts and commentators, i.e. weighting opinions and probabilities.

The qualitative-quantitative opposition may perhaps be understood as an approximation to the difference between forecast and foresight, as distinguished for instance by Poli (2017). The second attribute refers to the capabilities of methods, that is the ability to gather or process information based on evidence, expertise, interaction or creativity. These attributes are not exclusive or restrictive. In fact, they could be better understood if presented as "genetic"' components of a method. Using the same analogy, the "genetic structure" of an activity carried out using expert panels could be estimated as consisting of 70 per cent expertise, 10 per cent evidence, 10 per cent creativity, 10 per cent interaction, while the same activity carried out using citizens' panels could consist of 10 per cent expertise, 10 per cent evidence, 10 per cent creativity, 70 per cent interaction (Popper, 2008).

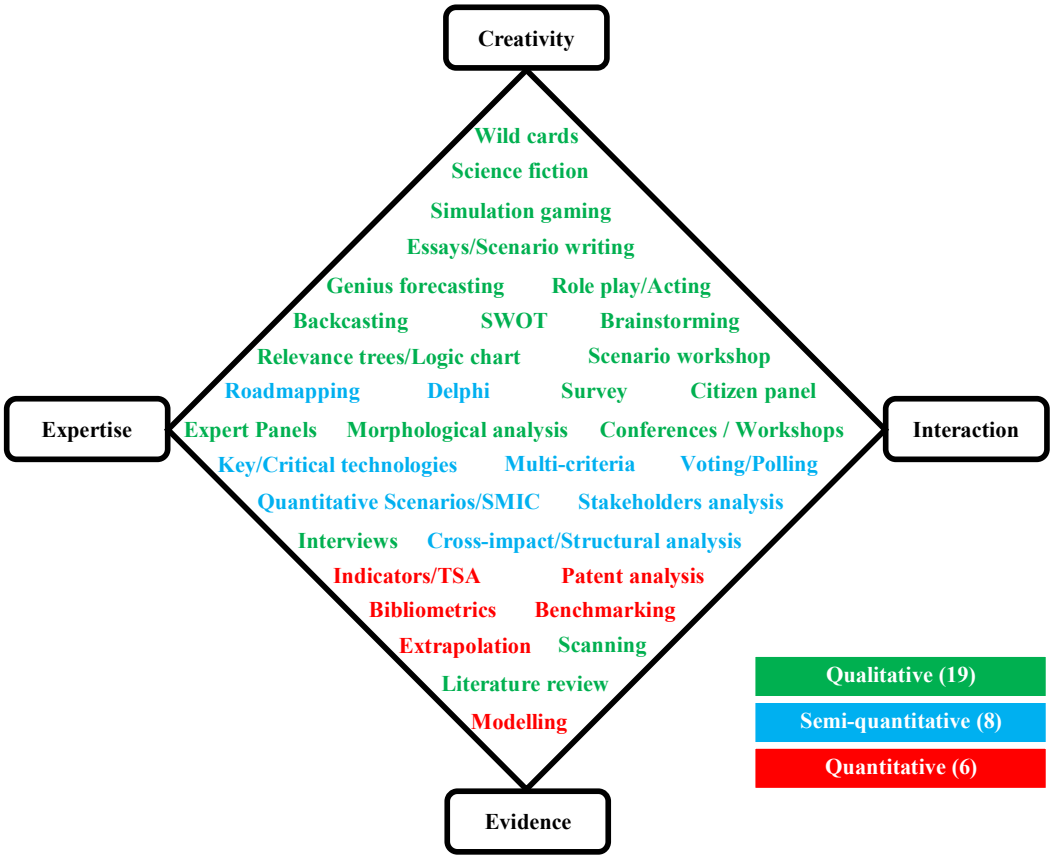
- **Evidence** recognizes that it is important to attempt to explain and/or forecast a phenomenon with the support of reliable documentation and means of analysis of, for example, statistics and various types of measurement indicators. These activities are particularly helpful for understanding the actual state of development of the research issue.
- **Expertise** refers to the skills and knowledge of individuals in a area or subject and is frequently used to support top-down decisions, provide advice and make recommendations. These methods rely on the tacit knowledge of people with privileged access to relevant information or with accumulated knowledge from several years of working experience on a domain area. Expertise often allows for a more holistic and comprehensive understanding of the theories, hypotheses and observations of a study (Scapolo & Miles 2006).
- **Interaction** recognizes that expertise often gains considerably from being brought together and challenged to articulate with other expertise (and indeed with the views of non-expert stakeholders). So, given that foresight studies often take place in societies where democratic ideals are widespread, and legitimacy is normally gained through ''bottom-up'' and

participatory processes, it is important that they are not just reliant on evidence and expertise (Cuhls, 2003).

- **Creativity** refers to the mixture of original and imaginative thinking and is often provided by artists or technology ‘‘gurus’’, for example. These methods rely heavily on the inventiveness and ingenuity of very skilled individuals, such as science fiction writers or the inspiration that emerges from groups of people involved in brainstorming sessions (Cassingena & Pace 2004).

The above attributes are the building blocks of the Popper’s Foresight methods Diamond (see Figure 6). The **Foresight Diamond**(Popper, 2008) includes some 33 methods in terms of the main type of knowledge source on which they are mainly based. These sources of knowledge (creativity, evidence, expertise and interaction) are certainly not fully independent from one other; however, it is possible to use them to highlight the most representative features of each method.

Figure 6. Foresight Methods Diamond



Source: Adapted from Popper (2008)

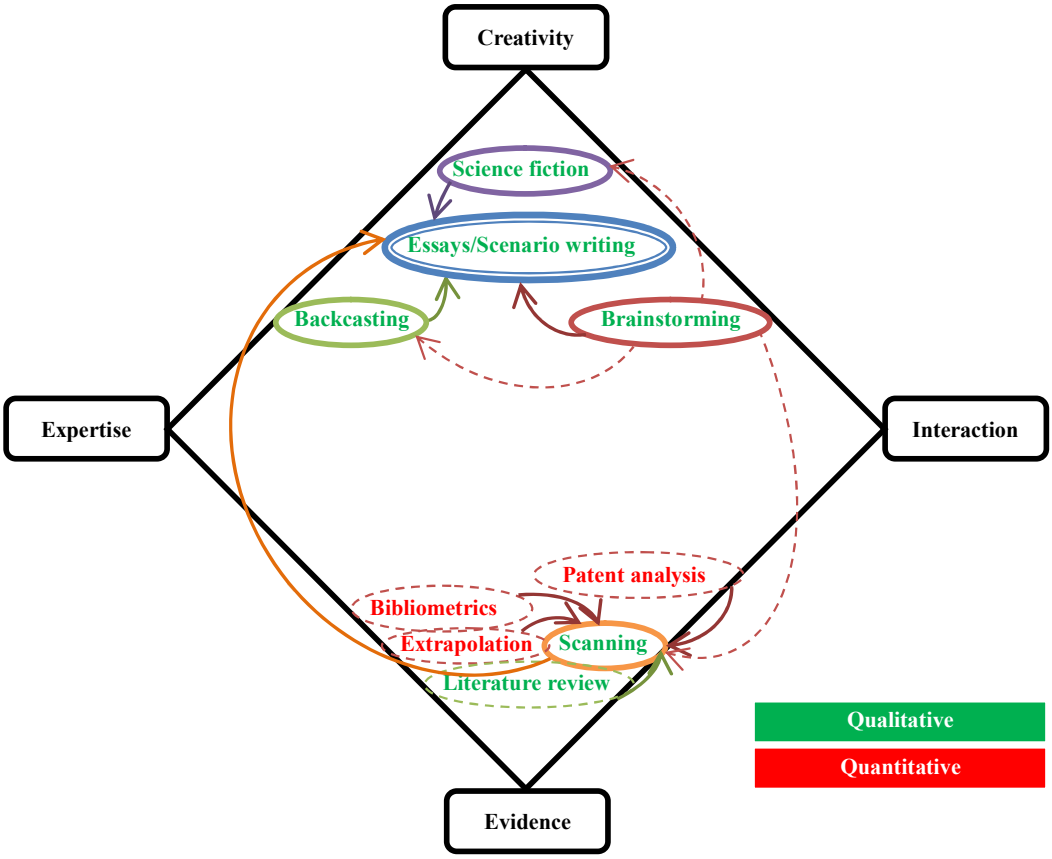
5. Methodology and results

No-one can predict the future, yet we all make plans based on our assumptions and desires. Making plans in a changing and complex environment is a little like being the captain of a ship faced with uncertain weather and variable seas. Yet, he still puts to sea in pursuit of his desires. But, despite the daunting prospects and just like the captain, if we know where we want to go we can chart a course,

navigate with our compass, use our lookout's weather eyes, and trim our sails to make the best of the changing conditions. These methods give us a far better possibility of reaching our destination than trusting in providence.

For this, a mix of quantitative and qualitative methods and tools in order allow one to combine different approaches. They are all been used on a simplified individualistic level. Examining the pros and cons of each method resulted in a mix of foresight methods that are used for this paper. Methods and the path used is presented using Foresight Diamond (see Figure 7). As it can be seen in the Figure 7, a combination of methods based on *evidence* and individual *creativity* are used for foresight in this paper.

Figure 7.Methods and the Path Used for Conducting Foresight

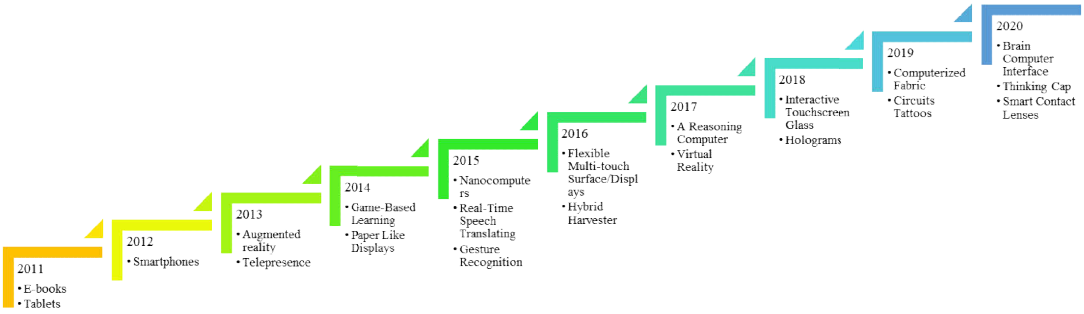


Foresight exercise was done in 2010 (Arnaut) for the period of 2011 to 2020 (10-year period) by using suggested combination of methods. In the Figure 8.We can see the what prediction of technologies that are considered as those who will have a great impact on education and learning. These technologies and their relevance are product of foresight techniques. The focus is on higher education and the potential relevance of varying *key technologies* for teaching, learning, or creative inquiry.

Over the next decade these changes had a significant ripple effect on education. Advanced technologies put education within the reach of many individuals all around the world, allowing them greater specialization in curriculum as well as teaching methodologies. This led to a challenge to support the adoption of technology on universities.

Seeing this foresighted future today we can see that most of technology started and even matured in predicted period. Therefore, we can conclude that foresight methodology that was used can be useful for predicting technology trends which can be used to shape learning and even improve education systems by using new technology.

Figure 8. Foresighted future 2011-2020



Source: Adapted from Arnaut (2011)

We recommend and plan that future research should aim at examining maturity of predicted technology and adoption rate in correspondence with predictions to see if there is causality between foresighted future and technology adoption and maturity of technologies. Also, future research should analyse adopt of new predicted technologies in learning process.

6. Conclusions

With electronic technologies today, change is the only constant. Educational institutions are already starting to augment the traditional settings building virtual learning communities. Emerging technologies are enabling students to connect with educators and other students in an unprecedented manner by merging the potential of student-cantered learning methodologies with interactive collaborative educational experience. The need for an enriched learning experience is coming from educators who are recognizing the power of communication and collaboration tools, as well as students who expect the latest *in* multimedia and interactive technologies. As a result, educational institutions are under big pressure to attract and retain students. Therefore, they must offer a broader range of rich media services to increase the potential for better students' engagement. New trends in education lead to the student-cantered learning and the ubiquitous use of technology in learning to create more personalized learning.

We must keep in mind that there are many countless ways technology might develop during the next decades. Knowing exactly what these developments will be or where they will lead is not just impossible, but it is also unimportant. Educators must take into consideration the recognition of what is possible.

Hardest thing to predict would be the social implications. In dealing with these implications many will look to education. We can prepare adequately for these implications only if we look ahead. We should always pose a question: *what do educators see when they look ahead?*

We need to face the fact that we live in an information driven world, and that students are communicating more and more through technological sources. The need to adapt to their learning curve is now more crucial than ever. Educational institutions that ignore the trends that are shaping tomorrow will cease to be relevant in the lives of their students, and therefore they will probably perish. To simplify it with the quote from Star Trek, the *resistance is futile*. It is crucial that we

transform all formal institutions of learning to ensure that we are preparing students for their future, and not for our past. As John Dewey said, *if we teach today as we taught yesterday, we rob our children of tomorrow*. Therefore, as educators, our opportunities to elicit change and spur creativity everywhere we go are endless. How many of our lives were changed and influenced, or our life's path altered because a special teacher reached out to us and believed in us? Every single educator has that opportunity to be that memorable person in a student's life. The technology we have at our disposal can help us to become those memorable teachers of tomorrow.

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Original scientific paper / Izvorni naučni rad

THE USE OF INFORMATION AND COMMUNICATION TECHNOLOGY IN ENGLISH AS A FOREIGN LANGUAGE – A VIEW FROM BOSNIAN CLASSROOM

Abstract

Over the last decade, development of Information and Communication Technologies (ICT) has brought many changes in all aspects of human lives. Important changes have been noticed in the field of education as well. In relation to those changes, the aim of this research was to explore the use of ICT in English language teaching and learning at the elementary schools in Bosnia and Herzegovina. Empirical research has been conducted and divided into two parts. The first part of research included the use of survey for questioning students and their schools. This study investigated 211 students and their 11 teachers from 9 cities of Bosnia and Herzegovina in relation to (a) school Information and Communication Technologies (ICT) infrastructure, (b) levels of perceived ICT skills, (c) students' and teachers' perceptions and expectations of ICT use in English language classrooms, and (d) obstacles to using ICT in learning English. In the second part, a short –termed experiment was conducted to explore whether deployment of ICT in teaching new vocabulary to the young learners produces significant results in English language classrooms. The findings of the study revealed that a great majority of students attribute positive remarks for integrating technology in language teaching and learning. However, schools very often face difficulties: schools do not own adequate ICT equipment nor tools, teachers do not have professional training on integrating technology into their teaching, the problem with school time organization, and others. Moreover, the findings of the experiment proved that technology can be used as an engaging and supplementary tool to foster vocabulary learning for English Language Learners.

Keywords:*Information and Communication Technology (ICT), Attitudes toward ICT, young learners, ICT education.*

1. Introduction

As technology entered in most aspects of people's lives the role of the modern teachers has changed and it has brought another important dimension in the field of education. The modern teacher has to recognize the need for integrating technology in his teaching. Information and Communication Technologies (ICT) became a part of people's everyday life experience and fundamental to life in the modern technological society. Moreover, the spread of technology and the use of English language changed the way of teaching English in a way that both have become essential literacy skills for a modern person. Similarly, across the globe, ICT is playing a central role in people's lives and especially among young people. To equip these young learners to be literate lifelong learners and global citizens of the 21st century it is necessary to successfully integrate ICT into both the English curriculum and English pedagogical practice. In addition, if the schools in Bosnia and Herzegovina want to follow these global trends, it is important to investigate the present status of ICT use and implementation in the elementary school systems. This study sets out to give a general overview of the availability of technology for English as a foreign language (EFL) teaching and learning in Bosnian elementary school classrooms, to outline the various uses of information and communication technologies in this sector, to investigate students' and teachers' opinions and

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attitudes toward the use of ICT, to provide an experiment illustrating successful deployment of ICT resources, and to point towards future developments and possible ICT implementation in the future.

English language teaching and learning is a very complex process because it encompasses required learning outcomes, previous knowledge, learning styles, motivation, culture, and numerous other factors. The main aims of this study are to identify key factors which influence on the use of ICT in English language learning and teaching of young learners and explore the availability of technology for English as a Foreign Language learning and teaching in Bosnian elementary school classrooms. Moreover, the study will demonstrate whether deployment of ICT influence on the results of learning English language, and explore and determine obstacles for using technology in educational purposes. It is also important to provide a critical review of the study results and suggest clear directions for using these results for improvement of educational process through the use of information and communication technologies.

2. Literature review

Although the traditional methods of learning are considered to be useful for studying English language, there is evidence that methods based on technology contribute to teaching and studying. Integration of technology into the process of learning motivates and supports students to reach better results (Altun, 2015). The use of ICT in English language teaching and learning contribute to acquiring skills related to problem solving, information analysis, development of critical thinking, encouraging active, independent, autonomous and collaborative learning of language, it motivates and simplifies studying of language, and improves teacher's trainings. It also improves students' language skills and has significant role in development of creativity while providing interesting, enjoyable and entertaining alternative methods for language learning (Ahmadi, 2018).

On the other hand, integration of ICT in foreign language teaching has its limitations and it has to be integrated in a way to serve as additional and valuable complementary teaching tool (Çakici, 2016). The project implemented by organization Save the Children provided research results which showed that the use of ICT in education has great potential for promotion of interactive learning but also depends on the design and implementation of technology and teachers' education (Parvin I Salam, 2015). Dashtestani (2014) also supported the idea of giving importance to teachers' education. Accordingly, EFL (English Foreign Language) teachers who are the implementers of CALL (Computer Assisted Language Learning) materials should be trained in how to make use of technology and CALL materials efficiently.

ICT use by teachers has been under investigation for a long time. A number of factors influencing language teachers' ICT use have been identified: prior experiences of using technology, ICT training, beliefs about the role of technology, attitudes toward ICT use, teachers' capabilities in using technology in instruction, willingness to integrate ICT into their teaching, the administrators' support and curriculum design.

However, it is important to use ICT carefully and with appropriate pedagogies and methodologies. In this way it is possible to bring positive changes in the EFL classroom and turn classrooms into open digital environment of learning (Azmi, 2017)

The results of research conducted at the University of Zagreb showed that even though the young people use ICT greatly today, they do not use ICT potentials for individual learning of foreign languages. The students spend on the Internet only 1/3 out of 4.26 hours per day for school purposes. The results of this study also showed that professors of this university also use ICT during FL classes. However, lack of equipment leads to limited use of ICT resources (Legac, et. Al., 2017).

The goal of placing technology in the English language classroom is to provide new ways for students to learn. When learners are able to use technology tools to obtain information, analyze, synthesize, and assimilate it, and then present it in an acceptable manner, then technology integration has taken place. Teachers have to be familiar with the technology literacy of their

learners if they want to integrate technology successfully. Winke and Goertler (2008) claimed that information on students' computer access and literacy is very important predictor for successful use of CALL.

When it comes to the restrictions over the ICT use and the age of learners, use of technology for English language learning does not appear to be restricted to any particular age group. In many contexts, even in Bosnia and Herzegovina, learners are being exposed to a range of technologies from a very early age in their homes and by the time they reach school age many have developed at least some of the digital skills.

James (2014) explored the third grade English Language learners who were not meeting Grade Level Expectations in reading and who were enrolled into the computer emphasized Waterford Early Reading Program. The results showed that learners improved their reading fluency through this computer emphasized reading program.

Another study was completed to test whether it is effective to use computer-assisted instructions (CAI) in individual learning and whether multimedia CAI techniques can improve vocabulary learning and memory. According to results of conducted experiment, CAI supported vocabulary learning more effective than traditional methods (Shi, 2017).

Bataineh and Hani (2011) examined the potential effect of a computerized instructional program on Jordanian sixth-grade students' achievement in English. The findings suggested that achievement is significantly affected by the medium of instruction showing differences between the achievements of traditionally and computer-instructed participants in favor of the latter. Additionally, the use of the computer program was found to foster not only motivation but also classroom interaction, especially student-student, student-teacher, and student-computer.

3. Theoretical framework

The most fundamental concepts of this study include the following terms: young learners, elementary education and ICT.These are common termsin every education system, however their scope and interpretation is not identicaleverywhere.

ICT acronym stands for Information and Communication Technology. There are numerous explanations and definitions related to ICT, and one of these claimed that 'Information and communications technologies are a diverse set of technological tools and resources used to communicate, and to create, disseminate, store, and manage information (Blurton, 1999)**.** However, by ICT in the context of education, the new digital information and communication technologies do not represent single technologies but combinations of hardware, software, media, and delivery systems. It encompasses a great range of rapidly evolving technologies such as desktop, notebook, handheld computers, digital cameras, local area networking, the Internet and the World Wide Web, CD-ROMs and DVDs, and applications such as word processors, spreadsheets, tutorials, simulations, electronic mail(email), digital libraries, computer-mediated conferencing, videoconferencing, and virtual reality. ICT used for educational purposes represents acollection of all these computer-based technologies, which are exploited to support teaching and learning, communication and collaboration, self-expression and creation, for the promotion of all developmental domains of children, and learners of any age (Kalaš, I., et al., 2012).

There are many explanations to describe what the term young learners encompass. One of them defines young learners as learners aging 6-12 years who are attending elementary schools. Elementary education in Bosnia and Herzegovina usually begins at age of six and lasts for nine years. Programs at the elementary level generally require no previous formal education, although it is becoming increasingly common for children to attend a pre-elementary program before entering elementary education.

In the context of education and English language classroom, ICT use in general terms is any use of "computing devices such as desktop computers, laptops, handheld computers, software, or Internet in K-12 schools for instructional purposes" (Hew & Brush, 2007, p. 225, cited in Rahimi & Yadollahi, 2011). However, more specifically it refers to the use of technology by teachers for instructional preparation, instructional delivery, and technology as a learning tool for students (Inan & Lowther, 2010; cited in Rahimi & Yadollahi, 2011).

It is important to mention a close and deep relationship between English language and technology. ICT and English language have established the strong relationship. Web based technologies and powerful internet connections provide various new possibilities and trends for teachers and learners. In fact as the electronic media, the internet and the use of cyber space in education have become the inseparable elements of education in the global atmosphere today, special attention must be paid on how to use the information communication technology (ICT) and virtual learning environments (VLE) to meet the demands of the era.

Depending on the expected learning outcomes and activities, ICT plays different roles in the learning environment**.** Based on how an ICT tool is used in the classroom, ICT tools can be classified into four types (Chen, Hsu & Hung, 2000; cited in Lim and Tay, 2003):

1.*Information tools* - applications that provide information in various formats (e.g., text, sound, graphics or video). Examples include multimedia encyclopedias or resources available in the World-Wide Web (www).

2.*Situating tools* - systems that situate students in an environment where they may "experience" a context and happenings. Such systems include simulations, games and virtual reality.

3.*Construction tools* - usually tools that can be used for manipulating information, organizing one's ideas or representing one's interpretations. For instance, mind mapping or social networking applications that allow students to organize their ideas or reflections, and communicate these ideas and share with others.

4.*Communication tools* - applications that facilitate communication between teacher and students or among students beyond the physical barrier (of space, time or both) of the classroom. The important examples are e-mail, e-conferencing and e-discussion boards.

The term *technology* refers to the use of systems that rely on computer chips, digital applications, and networks in all of their forms. These systems are not limited to the commonly recognized desktop and laptop computers: Almost all electronic devices these days include an embedded computer chip of some sort (DVD players, data projectors, interactive whiteboards, etc.). In addition to the term technology, the terms digital, electronic,and CALLalso appear (TESOL, 2008).

In the last decade, the computers and the Internet have become widespread in schools and homes and their uses have expanded so dramatically that the role of computers in English language instruction has now become an important issue. The use of computers is language learning and teaching is related to the term CALL – Computer Assisted Language Learning. Warschauer (1998) provided an overview of CALL history which can be roughly divided into three main stages: behavioristic CALL, communicative CALL, and integrative CALL. The first phase of CALL (conceived in the 1950s and implemented in the 1960s and '70s) was based on the then-dominant behaviorist theories of learning. Programs of this phase entailed repetitive language drills and were referred to as "drill and practice" which was based on the model of '*computer as tutor'*. The second phase of CALL was based on the communicative approach to teaching which became prominent in the 1970s and 80s. In addition to '*computer as tutor',* two another CALL models used for communicative activities were included: the '*computer as stimulus*' and the '*computer as tool'*. The last stage was represented by integrative approaches to CALL which is based on two important technological developments of the last two decades: multimedia computers and the Internet.

Bax (2003) criticized Warschauer's phases of CALL claiming that formulation which Warschauer proposed needs clarification and amendment in number of areas. He argues for three new categories—Restricted, Open and Integrated CALL giving a different division of CALL.

4. Methodology

The investigation included the use of the questionnaires for students and their teachers. This study included only English language teachers who worked with examined students. In this way direct connection was established in order to have more relevant investigation and to be able to compare students' and their teachers' opinions and attitudes as they worked in the same environment (schools) and with the same opportunities regarding available ICT. The questionnaire and its creation involved several steps: construction of the first version of the questionnaires, pilot testing, and elaboration of the definite version of the questionnaires. The questionnaires were distributed to 11 schools in 9 towns of Bosnia and Herzegovina purposely selected for the investigation including: Tuzla, Mostar, Banjaluka, Duboki Potok, Bijeljina, Olovo, Teslić, Tešanj, and Zenica. One school per every town was investigated apart from Tuzla and Banjaluka where two elementary schools were included. All towns have the same elementary school systems. All of the students who participated in the study were 6 graders. Over a span of two months, all questionnaires were completed and returned to the researcher.
The first section of the students' questionnaire focused on demographic information of the students based on gender, grade, availability and function of computers in the school, and students' present English learning situation related to ICT use. The second section was related to the students' use of ICT in their daily life. They were asked to rate their experience with ICT tools. The questions in this section were formulated as Yes/No questions, ratio scale questions and Likert-type questions. The third section consisted of Likert-type questions. The students were asked to rate their attitudes toward ICT, perceptions and expectations of ICT use in English learning.

The first section of the teachers' questionnaire focused on demographic information of teachers based on gender, age, and teaching experience. The second section described school ICT infrastructure and access to infrastructure. The third section covers teachers use of ICT in daily life and teachers ICT skills. The fourth part focused on materials and activities used for teaching and obstacles to using ICT in teaching and learning. The fifth section includes teachers' opinions and expectations about ICT use impact on student learning, and attitudes towards ICT. The second, third, fourth and fifth section consisted of Likert-type of questions and Yes/no questions. It was estimated to take the participants approximately 10-15 minutes to complete the questionnaire.

Quantitative data collected from the questionnaire were analyzed using SPSS in order to answer research questions. Data analysis procedures included the following:

- Descriptive statistics (frequencies, means, standard deviation) was used to describe the basic feature of the data;
- An independent t-test was used to find out about potential relationship between certain variables

Experiment was conducted with the 5^{th} graders of elementary school of Kladanj, including two groups of students: control group and experimental group. There were 31 participants, 17 of them in the control group and 14 participants in the experimental group. These students had been learning English language for 4 school years.

The test was used to examine students' knowledge of vocabulary related to family members, toys, sports, and feelings. The test included different kind of tasks: naming words, translation, finding the odd man out and matching type of tasks. It is expected that some of these words are familiar to students. On the other hand, certain words from the test were supposed to be learnt in the lessons planned for September. In this way, the researcher tested the current knowledge of the words relevant to the future English language learning. It is important to note that the teachers did not

teach new word every class within the experimental period. The teachers followed the school curriculum.

The researcher and the teacher were agreed to work with similar lesson plans. The teacher of the control group was expected to use only CD related to the textbook. The teachers of the experimental group had a freedom to include any type of ICT that follows the school curriculum. For this study, the teacher of experimental group included PowerPoint Presentations, videos related to learning words and one short animation movie also related to the vocabulary learning.

The tests were created and distributed to the experimental and control group in the elementary school of Kladanj in September 2014. The test was conducted at the beginning of the second lesson of English language classes. It was expected that students will need 15-20 minutes to complete the test. Still, the teachers provided enough time for the slow learners. After the tests were collected from the students, they have been kept in the closed envelope for the whole time of experimental period. The teachers were not allowed to take a look at the test in order to make the testing and experiment objective as much as possible. If the teachers knew the weak sides of their students they might be able to influence on certain students in a way to force learning certain words. After one month, at the beginning of October, the same test was given to the same students. In this way, the students were tested how much they have learnt during the experimental period. The teachers kept the record of the students' attendance during the classes to make sure that all students participated in all classes related to vocabulary learning.

5. Results and discussion

In reference to students' responses, the analysis of data provided information regarding students' access and use of ICT, attitudes and perceptions towards the use of ICT, and their expectations about the impact of ICT use in English language learning and teaching.

One of the main functions of computers in schools is to be used for computer science lessons (90%) which means for any other purpose (e.g. searching online materials, displaying PPT materials, etc.) the use of computes is at a very low level. Moreover, results also showed that the main teaching materials for English language were textbooks and that most of the students (72%) consider these textbooks a bit boring. Furthermore, it should be noted that half of the students never got recommendations by their teachers to use online resources. These results seem to show that students do need some changes in the standard way of teaching and learning English.

When it comes to students' use of ICT in their daily life 93.4% of students replayed that they own a computer at their homes and 88.2% of those computers are connected to Internet. Almost half of them (47.4%) use computers every day and spend one (36%) or more than two hours (20.4%) per day working on the computer. If we consider the fact that these students come from different areas of Bosnia and Herzegovina, rural and urban, and probably with diverse socio-economical background, these data indicate high results.

In reference to their use for certain activities (Table 1), they marked using Facebook as a way of communication with their friends as the most frequently used activity. Nevertheless, for other activities like playing games, finding information for school projects and learning English language, the results showed high students' engagement as well. These results demonstrate that even younger students like 6th graders spend a lot of time on Facebook pages. It is important to note students' level of interest and participation for learning English language (47.9% of students stated they use ICT for English learning) even though half of them never got recommendations from their teachers to use English language resources.

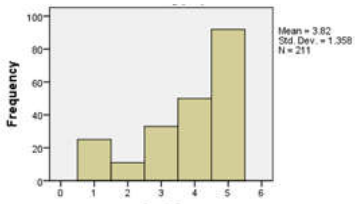
Table 1: Students' ICT activities

Question	Frequency		Percentage	
	Yes	No	Yes	No
Playing games	130	81	61.6	38.4
Finding information for school projects	139	72	65.9	34.1
Learning English language	101	110	47.9	52.1
Facebook (communication with friends)	160	51	75.8	24.2
Other	18	193	8.5	91.5

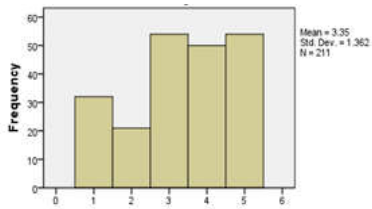
Source: Author

The students were also asked to evaluate their level of ICT in using search engines (Google, Yahoo, etc.), Word processors, Database packages (e.g. Microsoft-Access, Excel), etc. The students' responses showed that they most of them are very experienced (38.4% of students claimed they are very good) at: www/searching engines (like Google, Yahoo, etc.) and chatting options (Facebook, Skype, MSN, etc.), although the students claimed to have high experience (32.7% of students claimed they are very good) at using online sources for English learning.

The next part of the students' questionnaire included questions related to students attitudes toward use of ICT. They were given five scales: (1) strongly disagree, (2) disagree, (3) neutral, (4) agree, and (5) strongly agree. When asked whether they like to use computers for learning purposes, the most frequent answer was *strongly agree* (mode=5). Mean was 3.82 and standard deviation was 1.358 (Graph 1). In Graph 2, students stated their feeling of being confident to use internet and computer, displaying mean 3.35, standard deviation 1.362 and modes 3 and 5 equally distributed.

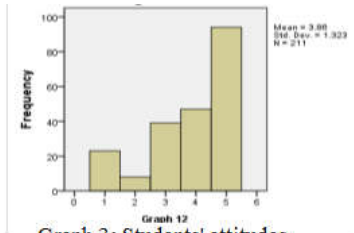


Graph 1: Students' attitudes toward use of ICT (Learning purposes)



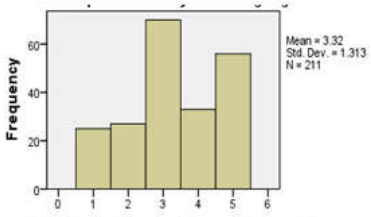
Graph 2: Students' attitudes toward use of ICT (Feeling confident)

The next question of this part of questionnaire was related to students' willingness to devote their time online for English learning purposes. As shown in Graph 3, the results displayed mean=3.86 with standard deviation 1.323 and mode 5.

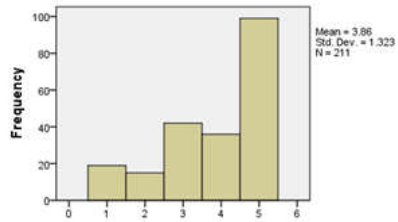


Graph 3: Students' attitudes toward use of ICT (Willigness to devote time)

For the question related to the computers' necessity for learning English, the results were displayed at Graph 4, showing mean 3.32 with standard deviation 1.313 and mode 3. Furthermore, students expressed their perceptions that learning English language can be more fun if Internet is used for communication with people online, with results showing mean 3.86, standard deviation 1.323 and mode 5 (Graph 5).

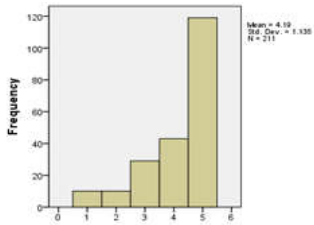


Graph 4: Perceptions of use of ICT for English language (Computer's necessity for learning English)

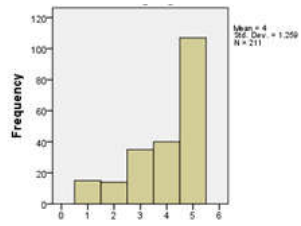


Graph 5: Perceptions of use of ICT for English language (ICT makes learning English more fun)

In reference to students' expectations towards the use of ICT in English classes, there are some interesting data. When asked whether they hope that the use of ICT shall become more frequent for English classes, the most of them completely agreed (mode 5) with mean 4.19 and standard deviation 1.135. For the question whether students hope that using of ICT will help them learning English language in more efficient way, the majority students replied that they strongly agree (mode 5), with mean 4 and standard deviation 1.259 (Graph 7).



Graph 6: Expectations of ICT use in English learning (Future use)



Graph 7: Expectations of ICT use in English learning (Using ICT can help learning English language)

Teachers' questionnaire included questions related to school infrastructure, teachers' ICT skills and professional development, obstacles for using ICT in classes, and teachers' attitudes and expectations regarding ICT use.

In reference to school ICT infrastructure and access to it, responses showed diverse information. The most frequent ICT equipment was desktop computer without internet and data projector (72.7%). Moreover, almost half of the schools (45.5%) owns desktop computer with internet access and non-internet connected laptop or tablet. However, out of eleven investigated schools only one school owns interactive whiteboard.

Table 2: School ICT infrastructure

	Frequency		Percentage	
	Yes	No	Yes	No
Desktop computer without internet access	8	3	72.7	23.3
Desktop computer with internet access	5	6	45.5	54.5
Non-internet-connected laptop, tablet PC,	5	6	45.5	54.5
Internet-connected laptop, tablet	3	8	27.3	72.7
Interactive whiteboard	1	10	9.1	90.9
Digital camera or camcorder	1	10	9.1	90.9
Computer laboratory	2	9	18.2	81.8
Data projector	8	3	72.7	23.3
E-Reader (a device to read books and newspapers on screen)	0	11	0	100

Source: The author

Table 3 shows results of the investigation concerning professional development in ICT. Teachers were supposed to answer Yes/No-type of questions for every item displayed in the table (1=Yes, 2=No). Interestingly, all teachers stated that they have never take any course on multimedia (mean=2.00 and standard deviation 0). On the other hand, most of them participated in online communities (e.g. mailing lists, twitter, blogs) for professional discussions with other teachers and have learnt about ICT in their own time. For the rest of the enlisted options regarding professional development, the teachers marked with mode 2.

Table 3: Professional development in ICT

	Mean	Mode	Std. Deviation
Introductory courses on internet use and general applications (basic word-processing, spreadsheets, presentations, databases, etc.)	1.73	2	.467
Equipment-specific training (interactive whiteboard, laptop, etc.)	1.91	2	.302
Courses on the pedagogical use of ICT in teaching and learning	1.82	2	.405
Course on multimedia (using digital video, audio equipment, etc.)	2.00	2	.000
Participate in online communities (e.g. mailing lists, twitter, blogs) for professional discussions with other teachers	1.45	1	.522
ICT training provided by school/Ministry of Education/Pedagogical Institute	1.55	2	.522
Personal learning about ICT in your own time	1.18	1	.405

Source: The author

Table 4 shows teachers' responses regarding obstacles to using ICT in teaching and learning. They were supposed to answer 1-4 rated scale (1=not at all, 2=a little, 3=partially, 4=a lot) and state whether their use of ICT is affected by the enlisted options from table. The highest mean is for *'insufficient number of computers/laptops'* (standard deviation 0.505 and mean 4) and the lowest is for '*no or unclear benefit to use ICT for teaching'* and '*Using ICT in teaching and learning not being a goal in our school'* (mean=1). Teacher claimed that insufficient number of computers/laptops, interactive whiteboards, technical support for teachers and having computers out of date represent the main obstacles for using ICT in teaching and learning (mode 4).

Table 4 Obstacles to using ICT in teaching and learning

	Mean	Mode	Std. Deviation
Insufficient number of computers/laptops	3.64	4	.505
Insufficient number of internet-connected computers	3.55	4	.688
Insufficient number of interactive whiteboards	3.64	4	.924
School computers out of date and/or needing repair	3.00	4	1.183
Insufficient technical support for teachers	3.36	4	1.027
Too difficult to integrate ICT use into the curriculum	2.73	3	1.009
Lack of pedagogical models on how to use ICT for learning	2.73	3	.905

School time organization (fixed lesson time, etc.)	3.09	3	.701
School space organization (classroom size and furniture, etc)	2.73	2	1.009
Most parents not in favor of the use of ICT at school	2.00	2	.894
No or unclear benefit to use ICT for teaching	1.45	1	.688
Using ICT in teaching and learning not being a goal in our school	1.45	1	.688

Source: The author

In reference to teachers' opinion and expectation about ICT use impact on students learning (Table 5) teachers answered according to 4-point scale (1=not at all, 2=a little, 3=somewhat, 4=a lot). The highest mean was given for the option '*students remember more easily what they've learnt'* (4.27 with standard deviation 2.284). Interestingly, most of the teachers stated that all options can influence 'a lot' on students learning (mode=4) except for the option '*students try harder in what they are learning'* (mode=3, mean=3.18 with standard deviation 0.751).

Table 5 Teacher opinion and expectations about ICT use impact on student learning

	Mean	**Mode**	**Std. Deviation**
Students concentrate more on their learning	3.27	4	.786
Students try harder in what they are learning	3.18	3	.751
Students feel more autonomous in their learning (they can repeat exercises if needed, explore in more detail topics that they are interested in, etc.)	3.45	4	.688
Students understand more easily what they learn	3.27	4	.786
Students remember more easily what they've learnt	4.27	4	2.284
ICT facilitates collaborative work between students	3.27	4	1.009
ICT improves the class climate (students more engaged, less disturbing)	3.45	4	.934

Source: The author

5.1. T-test

T- test analysis was done to investigate whether there are differences between teachers' ICT education and its influence on students' responses regarding their attitudes toward ICT, perceptions of ICT use in English learning and their expectations. The required level of significance is less or equal to 0.05 for the every t-test conducted.

This study showed results and indicated that for certain students' attitudes and perceptions there is relation to whether teachers are ICT experienced or participated in ICT courses. In relation to their attitudes, students' responses provided the following results:

- students' likeness to use computers for educational purposes is related to the teachers education regarding introductory courses on internet use and general applications and equipment specific training;
- students willingness to devote their time online for English learning purposes is related to whether the teachers participated in introductory courses on internet use and general applications, equipment specific training and in online communities (e.g. mailing lists, twitter, blogs) for professional discussions with other teachers.

In reference to students' perception of ICT use for English language learning, there is higher level of agreement for the following:

- students' statement that computers can serve as tools for learning purposes is related to teachers education at equipment specific training and in online communities (e.g. mailing lists, twitter, blogs) for professional discussions with other teachers;
- students' statement that using computers is necessary in for learning English language is related to whether teachers participated in introductory courses on internet use and general applications, equipment specific training and in online communities (e.g. mailing lists, twitter, blogs) for professional discussions with other teachers;

5.2. Experiment

Analysis of experiment was done by calculating the average number of points collected for one group. Table 6 displays points individually per every task. For the whole test the students had an opportunity to collect 68 points.

Table 6: Task points

Tasks	Students have to :	Points
1	Name words for family members	8
2	Translate words (Bosnian to English and vice versa)	24
3	Write toys' names under the pictures	12
4	Fill in the gaps	8
5	Find the odd man out	6
6	Match words/phrases with pictures	10
Total		68

Source: The author

For the first test which was conducted at the beginning of the experimental period, the control group collected 34.8 points while the experimental group collected 31.4 points. At the final test which was conducted one month later, the control group collected 41.2 points and the experimental group collected 43.8 points (Table 7).

Table 7: Test results

Name of the group	Average number of points	
	First test	Final test
Control group	34.8	41.2
Experimental group	31.4	43.8

Source: The author

Analysis of results showed significant differences among the groups.

6. Conclusion

The role of ICT in the modern world has become very important. This study has been conducted to examine the use of ICT in terms of frequency of use, purposes, perceptions, and expectations among EFL students and their teachers. The research included 211 students and their 11 teachers who were invited to respond to the questionnaire survey. As a part of this study an experiment has been conducted to investigate the vocabulary development of English language students through the use of technology. The qualitative results from the questionnaires revealed that most teachers use textbooks while teaching students and that ICT integration in English language still has a long way to go. However, the study revealed that many of the English teachers were willing to make use of ICT for teaching and learning process. They indicated that technology in English language can make foreign language teaching and learning interesting.

In relation to the aims of the study, it can be concluded that they are achieved, as described below:

- The factors that influence on the use of ICT in English language learning and teaching of young learners have been identified (school ICT infrastructure, teachers' working experience and teachers' ICT education);
- The results of the experiment indicate that the deployment of ICT influence positively on the results of learning English language, especially for vocabulary acquisition;
- Concerning the availability of technology for English language learning and teaching, most of the students own personal computers at their homes. Most of the schools have computer rooms, which might be used by school for various purposes, but they are mostly used for computer science lessons.
- English language teachers determined the main obstacles for using technology for educational purposes, including insufficient number of computers/laptops, interactive

whiteboards, technical support for teachers, and the fact that school computers are very often out of date and need a repair;

The findings of this study contribute to general understanding of the current employment of ICT in elementary schools in Bosnia and Herzegovina. The identified factors that influence on the use of ICT and the positive results of experiment indicate that availability of ICT in education is supportive for the students to improve their knowledge. These findings lead to recommendations for school management to take a lead in encouraging the use of ICT and to find possibilities to improve school ICT infrastructure. The Ministry of Education should pay more attention to prepare teachers for the technology age and to provide continuous training to all teachers. The English language curricula should be revised and improved in relation to ICT use. In consideration to the fact that most of the students own computers at their homes, the teachers should recommend to their students available online sources for learning English.

However, the researcher also suggests certain recommendations for future research. In order to collect more relevant data and to make the research more objective, this research might be broaden and include more students and teachers from other cities of Bosnia and Herzegovina. A further study can be directed to observing teachers in real classroom setting while using certain ICT equipment or tools. Moreover, it should be explored whether schools have internal ICT policies and how effective are these policies.

Modern students are brought up in an environment marked by computer technologies, which implies that the role of computers in their lives is one of the central ones. The role of school in this respect is to provide such students with skills and knowledge that are necessary for future tasks. That is why it is essential for the Ministry of Education, not just to launch various projects, but also to supervise and support the initiation and maintenance of the ICT use.

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PhD, Anida Zahirović Suhonjić[1] *Original scientific paper / Izvorni naučni rad*

COMBINING CROWDSOURCING AND MICROLEARNING IN HIGHER EDUCATION

Abstract

The goal of this study is to combine two trends in e-learning, crowdsourcing and microlearning, to develop a new approach to learning in higher education and to gain insights regarding its impact on learning outcomes. The research was carried out on the School of business, information technology and market communications „International business-information academy“ Tuzla, Bosnia and Herzegovina on a sample of 66 students. The experimental group of students attended student-created microcourses on the Coursmos platform, while the control group was not influenced by this variable. There was a course designed on LMS Moodle for the experimental group, where they could perform their crowdsourcing activities and communicate with crowdsourcer. The learning outcomes are operationalized through three indicators: the total number of points for the laboratory exercises and the final exam and the final grade in the course. By testing the differences between the experimental and the control group, it was found that there were no statistically significant differences between the groups. However, the mean values for the indicators the number of points achieved for the exercises and the final grades are higher in the experimental, than in the control group.

Key words:*crowdsourcing, microlearning, microcourses, learning outcomes, higher education.*

1. Introduction

Crowdsourcing can be used in different domains to take advantage of the wisdom of the crowd, and some of those domains are business, marketing, medicine, education, sociology, etc. (Hosseini, Phalp, Taylor & Ali, 2014). Collective intelligence and crowdsourcing are used in education to take advantage of the collective knowledge and ideas, as well as for solving different problems from different users connected throug information and communication technologies (Heusler & Spann, 2014).

One of the trends in education is micro-learning, which is in this paper combined with crowdsourcing in order to improve the learning outcomes of students. This type of learning is adapted to the range of students' attention and it provides new ways to acquire targeted knowledge more easily compared to some other forms of learning (Sun, Cui, Yong, Shen & Chen, 2015). Microlearning is often implemented through microcourses which are available as open educational resources on different platforms.

Attendance of open educational resources on an open educational platform can conceptually be treated as crowdsourcing only when the requirements of the components of crowdsourcing process are fulfilled (Anderson, 2011). Some of those components are: crowdsourcing task, management, collaborative architecture, platform and outcomes (Pedersen et al., 2013). Attendance of open educational resources is mostly characterized by personalized learning and internalization of individual knowledge (Cress & Kimmerle, 2008; Kimmerle, Moskaliuk & Cress; 2011). However, using educational resources on an open platform can be treated as crowdsourcing in a way that students' personalized learning system is observed in the context of social networked groups

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(crowd) of students, so that they are able to externalize their knowledge (share resources, write comments and recommendations, etc.).

At the School of business, information technology and market communications "International business-information academy" Tuzla (IPI Academy) in the Electronic business course, the experiment of crowdsourced attending of student-created microcourses was conducted. This experiment is the extension of the experiment that started at the Faculty of Organizational Sciences of the University of Belgrade, where students through crowdsourcing process created microcourses that were then uploaded to the Coursmos platform and thus gained the characteristic of open educational resources. The goal is to combine two trends in e-learning, crowdsourcing and microlearning, to develop a new approach to learning in higher education and to gain insights regarding its impact on learning outcomes.

The rest of the paper is structured as follows. The next section provides research methodology. Then the results are analyzed and finally, the key findings are discussed and the conclusion is made.

2. Research methodology

The type of the conducted experiment is post-control post-experimental. The aim of this experiment is to evaluate the impact of crowdsourced attending of student-created microcourses on the Coursmos platform on students' learning outcomes. The basic research question is whether students who attend student-created microcourses achieve better results for laboratory exercises and final exam and whether they achieve a higher final grade than students who did not use this way of learning? The research aims to determine whether there is an increased performance of students who attended student-created microcourses compared to students who did not attend. The basic research hypothesis in the post-control post-experimental experiment is following: Students who attend student-created microcourses on the Coursmos platform achieve better results for the exercises and final exam, and they achieve a higher final grade.

2.1. Participants

Participants in the research were second-year undergraduate students from three study programs and a teacher who had a role of crowdsourcer. The experiment that has been conducted has characteristics of the post-control post-experimental experiment. The experimental and the control group were selected based on the simple random sampling procedure using a list of 66 students and generating random numbers using Excel. The characteristics of the experimental and the control group are given in Table 1.

Table 1 Characteristics of the experimental and the control group

Characteristics of the group			Frequency	Percentage (%)
Study program	Experimental group	Information technology	17	51.5
		Contemporary business	11	33.3
		Market communications	5	15.2
	Control group	Information technology	12	36.4
		Contemporary business	16	48.5
		Market communications	5	15.2
Gender	Experimental group	Male	24	72.7
		Female	9	27.3
	Control group	Male	26	78.8
		Female	7	21.2
Average grade during study	Experimental group	6-6.99	3	9.1
		7-7.99	16	48.5

		8-8.99	13	39.4
		9-10	1	3.0
	Control group	6-6.99	3	9.1
		7-7.99	14	42.4
		8-8.99	9	27.3
		9-10	7	21.2

Using T-Test, the experimental and the control group were tested based on their gender, study program and average grade during study. Given the obtained values ($p>0.05$), it has been confirmed that there are no statistically significant differences between groups by any of the criteria included, and based on that the groups are homogeneous. Of the 33 selected research units in the experimental group, three students did not accept to participate in the experiment. Only the members of the experimental and the control group who passed the final exam in the Electronic business course were taken into account in the analysis of the results of the experiment. The total number of group members with this feature was 28 for the experimental and 28 for the control group. Their characteristics are presented in Table 2.

Table 2 Characteristics of the experimental and the control group members who passed the final exam

Characteristics of the group			Frequency	Percentage (%)
Study program	Experimental group	Information technology	15	53.6
		Contemporary business	10	35.7
		Market communications	3	10.7
	Control group	Information technology	9	32.1
		Contemporary business	15	53.6
		Market communications	4	14.3
Gender	Experimental group	Male	20	71.4
		Female	8	28.6
	Control group	Male	22	78.6
		Female	6	21.4
Average grade during study	Experimental group	6-6.99	2	7.1
		7-7.99	13	46.4
		8-8.99	12	42.9
		9-10	1	3.6
	Control group	6-6.99	3	10.7
		7-7.99	10	35.7
		8-8.99	8	28.6
		9-10	7	25.0

2.2.Context

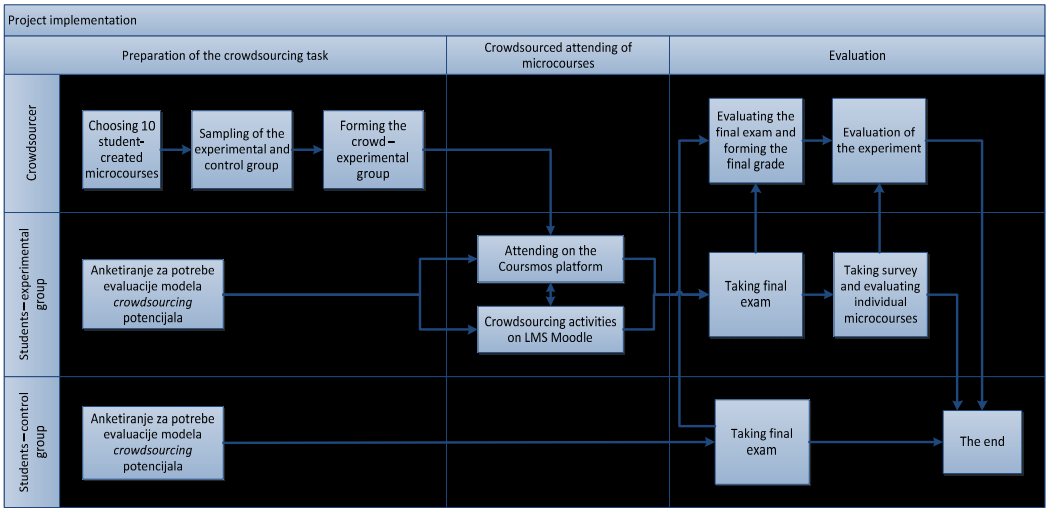
The research was conducted at the IPI Academy Tuzla, Bosnia and Herzegovina. It was conducted as a part of the coursework at the second-year undergraduate study at the course Electronic business in the 2015-2016 academic year.

2.3. Procedure

The project of crowdsourced attending of student-created microcourses at IPI Academy is the extension of the experiment started at the Faculty of Organizational Sciences at the University of

Belgrade, where students created microcourses which were published on the Coursmos platform (Zahirović Suhonjić, Despotović-Zrakić, Labus, Bogdanović & Barać, 2019). The teacher in the Electronic business course had the role of the crowdsourcer. All students who attended this course in the 2015-2016 academic year were participants of the experiment, either as members of the experimental or the control group. The crowd consisted of students who were selected for the experimental group. There was a Moodle course designed for the crowd, where students could communicate, ask the crowdsourcer questions, give answers and comments. Students of the experimental group could also perform crowdsourcing activities on the Coursmos platform, such as commenting, evaluating, sharing, etc. The procedure of project implementation is presented in Figure 1.

Figure 1 Procedure of project implementation



The teacher, as the crowdsourcer, carried out the preparation of the crowdsourcing task, selected 10 student-created microcourses for attending (Table 3), formed the crowd and designed the Moodle course for communication among members of the experimental group, as well as for the communication with the crowdsourcer. At that stage, all students took a survey, and they were later classified into experimental or control group.

Table 3 Selected microcourses

No	Microcourse
1	Installation of WAMP
2	Installation of Sublime development tool
3	HTML images
4	Padding and margin in CSS
5	Adding time and date on website
6	Creating table of contents in Word
7	Wordpress pages administration
8	Wordpress themes
9	Wordpress plugins
10	Wordpress menus

Students from the experimental group were informed that they could attend selected microcourses and that this activity was not mandatory within the course, but based on that they could earn bonus points for the final exam. Students in the control group, apart from attending microcourses on the Coursmos platform, were influenced by the same learning activities within the course Electronic business as the students of the experimental group. It is important to note that approximately 50% of the contents of the selected microcourses are contained in the curriculum of the Electronic business course in the part of the laboratory exercises. Of the total number of hours of laboratory exercises, selected microcourses covered approximately 30% of the exercises contents. Students in the experimental group were connected to each other, as well as with crowdsourcer. They could communicate via LMS Moodle. They could also use web and/or mobile access to the platform, and share microcourses on social media.

After attending microcourses, the students of the experimental (28) and the control (28) group took the final exam and their final grade was formed. The final test was conducted as a part of the regular course activities. Data on the number of points for laboratory exercises and final exam and the final grade was collected for those students. Questions on the final exam included questions from lectures and exercises. Finally, the students of the experimental group took survey using two instruments: a survey for investigation of the impact of microcourses on learning outcomes and a survey for assessing the quality of individual microcourses and examining crowdsourcing activities.

2.4. Variables and indicators

In the post-control post-experimental experiment, the independent variable was the attendance of student-created microcourses, while the dependent variable referred to the learning outcomes with the following indicators: number of points on the final exam (max. 50 points), number of points for the exercises (max. 20 points) and the final grade (from 6 to 10).

2.5. Data and methods of analysis

The data for the post-control post-experimental experiment was collected based on number of points on the final exam and exercises and the final grade on the Electronic business course, both for the experimental and the control group.

T-Test was used for analysis.

3. Analysis of results

The conducted statistical analysis had the goal to examine the statistical significance of the differences in terms of achieved results (number of points for the exercises and the final exam and the final grade in the course Electronic business) between students of the experimental and the control group.

The analysis included the students of the experimental and the control group who met all the requirements and received positive final grade.

3.1.Comparative analysis of learning outcomes of the experimental and the control group

The descriptive analysis includes a comparison of the frequencies, mean values and standard deviations of the indicators of the learning outcomes (dependent variable): number of points for the laboratory exercises and the final exam and the final grade. Figures 2, 3 and 4 show frequencies of the observed indicators for the experimental and the control group.

Figure 5 Final grades of the experimental and the control group

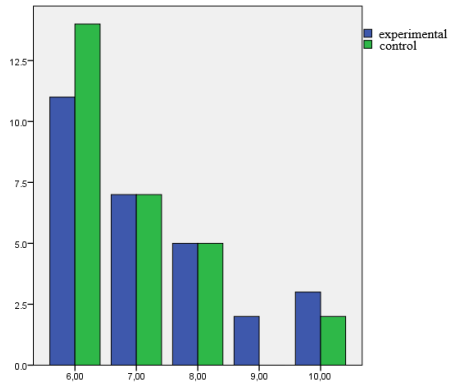


Figure 6 Number of points achieved on final exam for the experimental and the control group

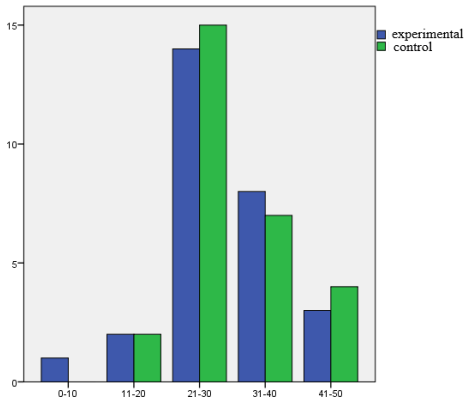
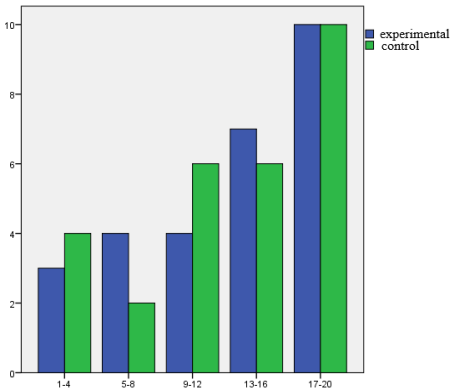


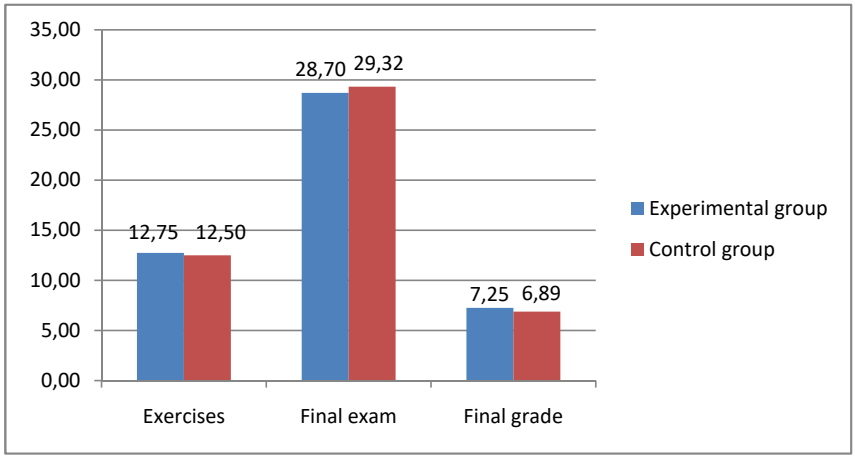
Figure 7 Number of points for the laboratory exercises of the experimental and the control group



Based on the frequency distribution, it can be noticed that there is considerable uniformity regarding frequencies between the experimental and the control group in terms of observed indicators.

The mean values of the observed indicators are presented in Figure 5.

Figure 8 Mean values of the observed indicators for the experimental and the control group



It can be noticed that the average final grade in the course Electronic business of the experimental group is higher than the average final grade of the control group. In terms of the number of points for the exercises, the experimental group also has a slightly higher average grade. However, in relation to the number of points achieved at the final exam, the control group achieved a slightly higher average score.

3.2.Testing the differences between the experimental and the control group

T-Test of independent samples was performed in order to test whether the differences between the mean values of the indicators of learning outcomes between the experimental and the control group are significant. Levine's test for equality of the variances shows the equivalence of the variance between the experimental and the control group in the following variables: number of points for the exercises and the final exam and the final grade (p>0.05). p values of the T-Test for the included variables are: $p_{\text{exercises}}$=0.882, $p_{\text{final\_exam}}$=0.781 and $p_{\text{final\_grade}}$=0.294. Since all p values are above the required value of 0.05, it can be concluded that there are no statistically significant differences between the mean values of the included variables between the experimental and the control group.

4. Discussion and conclusions

In the conducted experiment, the evaluation of the impact of attending the student-created microcourses on students' learning outcomes was carried out. The homogeneity of the groups was achieved by random sampling of the experimental and the control group. Learning outcomes, as dependent variables in the experiment, are operationalized through three indicators: number of points on the exercises and the final exam and the final grade.

The mean values of the indicators the number of points for the exercises and the final grade are higher in experimental than in control group. However, the control group has the higher mean value for the indicator number of points in the final exam. This can be explained by the fact that the contents of the selected microcourses were more related to laboratory exercises, and therefore influenced the final grade, while their contents were not subject of the final exam. By testing the differences between the experimental and the control group, it was found that there were no statistically significant differences in learning outcomes among students who attended microcourses, compared to others who did not.

This considerable uniformity in the learning outcomes of the experimental and the control group can be explained by two key arguments. First, the significant number of microcourses that the

experimental group attended were included in the curriculum of the Electronic business course. The second argument is that the content of the laboratory exercises of the Electronic business course covered a significant number of lessons that were contained in student-created microcourses. In this way, the students of the control group acquired some knowledge within the regular exercises that were contained in the microcourses that the students of the experimental group attended. However, higher average final grades and higher average number of points on exercises indicate that microcourses helped students of the experimental group to better master the materials of the course (Tang, Huo & Yuan, 2017).

Some of the limitations of this research are the following: the experiment was conducted at one higher education institution, limitation of the used platforms in terms of functionalities for crowdsourcing activities, and a small sample.

The research results provide opportunities for further research in the context of the development of crowdsourcing and microlearning in higher education in various educational environments and the application of crowdsourcing in learning. In order to achieve this, it is necessary to improve the technological architecture, and enable the integration of various services of the platforms for micro-learning, crowdsourcing and learning management systems.

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Selena Kurtić[1] *Review paper / Pregledni rad*

ANALYSIS OF STUDENTS E-LEARNING STUDY ACTIVITIES

Abstract

With the fast development of e-Learning innovation, the instability of the distributed Web services has become a hot research topic. The survivability of a Web framework at a specific timeframe is an essential and helpful marker for making a suitable change progressively to guarantee the framework runs better while the runtime condition or prerequisites are changed. However, most researchers only focus on estimating the overall survivability of a Web system. This article deals with analysis of students' behavior using the platform Moodle. Before planning a distance learning course, instructors have to pay attention to the fact that there exist different study methods: some students start reading, learning materials from the very beginning to the end, some students look at unclear topics only, some start with the discussion, etc. Therefore after analyzing, it is possible to prepare individualized learning materials and to choose a proper way of course presentation. Such a way of study organization would improve the quality of studies and make it possible to reach better results. The research was performed by observing the behavior based on Web log statistic to find out the factors that influence final evaluations of students.

Keywords:*e-learning, virtual learning enviroments, clustering, Web services, Analytical models.*

1. Introduction

In modern eduacation, the role of information technology, particularly the internet gains more importance. The term e-learning is widely used to describe the information technology supported educational process. Improving the quality of teaching practices, including evidence-based practices for science teaching, is the ability to choose the research results that are appropriate for the situation. The model was adopted in the program because it is considered to be constructivsit, using conceptual teaching, in the conceptual field as playing an important role in the e-learning teaching, (Lopes, Cravino, Cruz and Barbot, 2017).

Distance teaching and learning environment provide certain opportunities for instructors to observe student's learning behavior, (Targamadzė, Petrauskienė, 2008). Analysis of such an observation enables us to provide adaptive feedback, customized assessment, and more personalized attention by dynamical monitoring and tracking learners' online behavior, (Hung, Zhang, 2008). Despite a dramatic increase in higher education participation in Bosnia and Herzegovina over the last half century, we are still behind in e-learning in comparison to e-learning worldwide, (Alan, Weber, Hamlaoui, 2018).

This statistic (Figure 1) presents the compound annual growth rate of the fastest-growing e-learning segments worldwide from 2012 to 2017. Until 2017, the serious gaming market is projected to grow at 29.9 percent. That same year, spending on worldwide mobile educationis expected to reach 16.2 billion US dollars, up from 3.4 billion US dollars in 2011.

Different testing systems are used to establish a learner‘s behavior in the virtual learning environment. We can pick out two methods for establishing student's learning behavior: in communication and automatically, (Nash, 2018).

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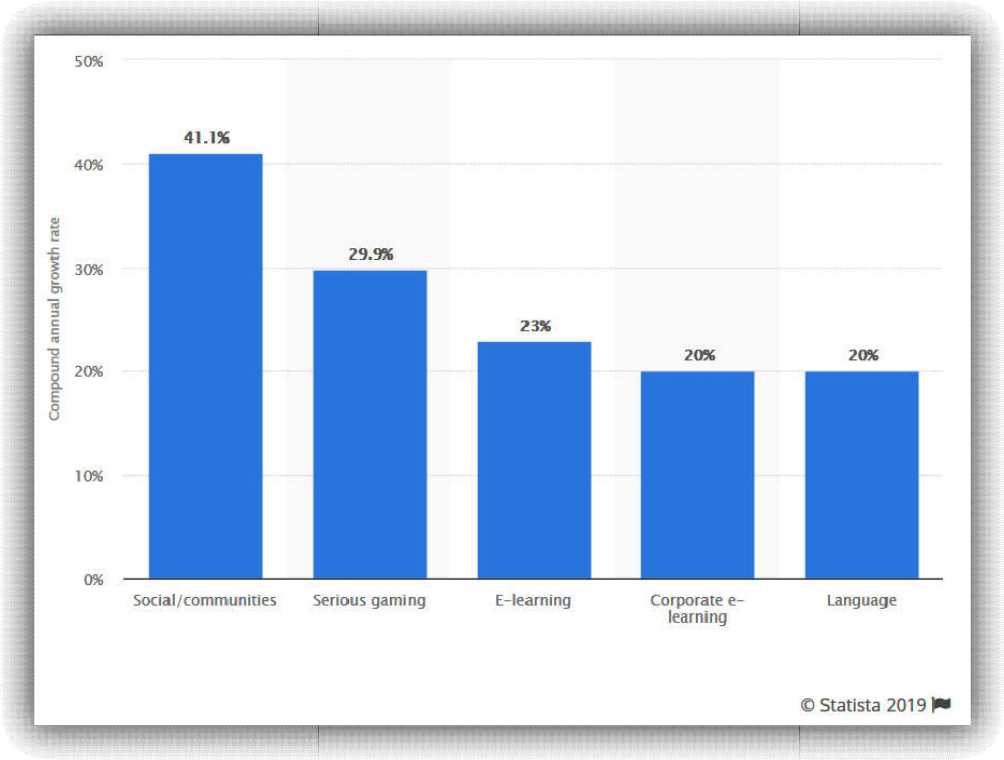
Fig 1. Compound annual growth rate of the fastest-growing e-learning segments worldwide from 2012 to 2017



(https://www.statista.com/statistics/273946/cagr-of-the-fastest-growing-e-learning-segments-worldwide/).

Before planning a distance learning course, instructors have to pay attention to the fact that there exist different study methods: some students start reading, learning materials from the very beginning to the end, some students look at unclear topics only, some start with the discussion, etc. In this research, these data are analyzed and recommendations are developed according to the results observed.

The latter approach allows us to find more objective evaluations and decisions because of escaping wrong answers from the questionnaires. Most popular virtual learning environments (VLE) are Moodle and BlackBoard Vista. Moodle, as a tool enables a teacher not only to report learning materials in a flexible way, but also to provide a possibility for learners to participate in common discussions, synchronous chats, create their blogs, review video files of the lectures, use email, etc. This is also a powerful tool for tracking students‘ activities and interpreting these results.

As a result, teachers design learning scripts that require from students to engage in well-structured complex collaborative learning and problem solving scenarios which require individual and team learning activities over authentic problems, the undertaking of roles for the join development of group deliverables, communication via chat/forum, co-sharing ideas and arguments using virtual workspaces as well as access to online learning resources, etc., (Dimopoulos, 2013).

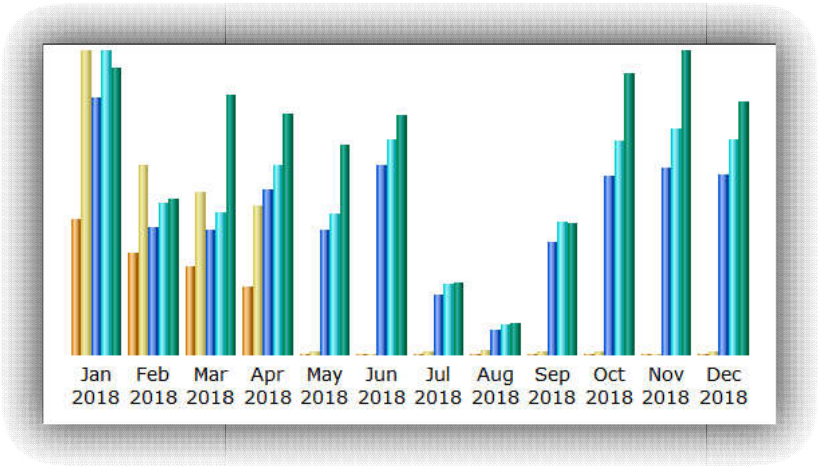
2. Exposition

This article deals with analysis of student’s behavior using the platform Moodle and web statistics from „International business-information academy“ Tuzla. Most of the largest universities and colleges use this software as well in other countries. Typically, Moodle takes student activities in

log files, (Moodle web page,2019). We observed the web statistics for one year (Jan 2018 – Jan 2019).

In Figure 2. we can see that the higher number of bandwidth is during the college year (October – June). Which is telling us that most of the students come to visit Moodle, do tests and download necessary study material during the classes.

Fig 2. Monthly history



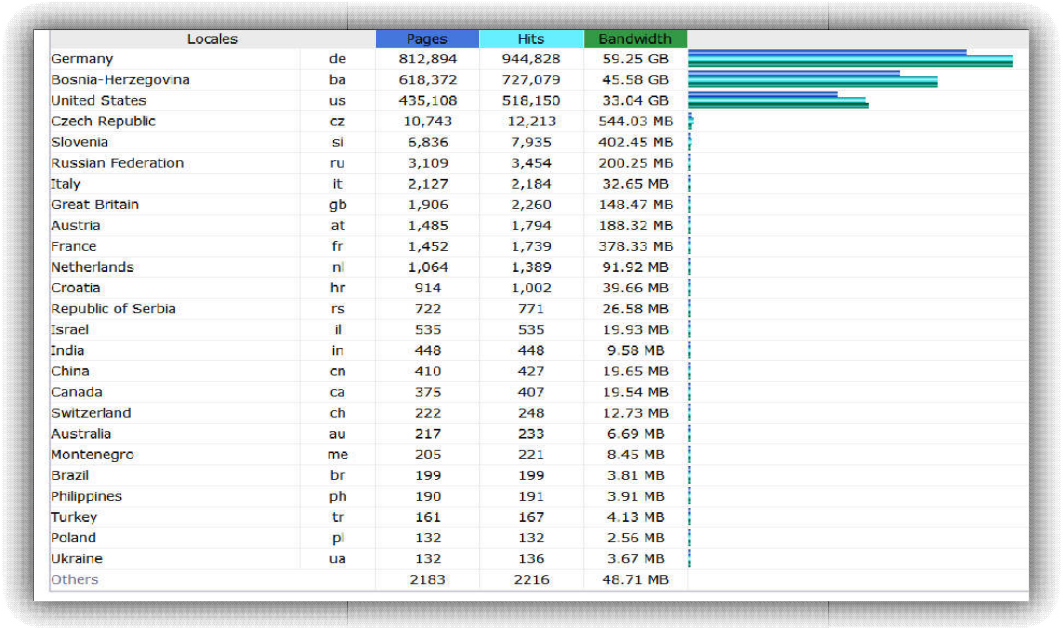
Two mayor subjects, from winter semester, have online exam in January and February. By the statistics, that's the time of the year when 80% of the students pass the exam.

Fig 3. Monthly history

Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Jan 2018	5,014	11,211	282,988	333,950	16.26 GB
Feb 2018	3,768	7,000	140,260	166,938	8.92 GB
Mar 2018	3,271	6,027	136,941	156,167	14.76 GB
Apr 2018	2,544	5,509	180,407	208,212	13.70 GB
May 2018	1	73	136,044	154,408	11.99 GB
Jun 2018	1	55	208,541	236,691	13.54 GB
Jul 2018	1	113	66,089	76,494	4.07 GB
Aug 2018	1	132	27,377	32,543	1.79 GB
Sep 2018	1	65	123,467	146,494	7.45 GB
Oct 2018	2	72	195,739	234,286	15.99 GB
Nov 2018	1	60	205,777	247,574	17.26 GB
Dec 2018	1	67	198,511	236,601	14.31 GB
Total	14,606	30,384	1,902,141	2,230,358	140.04 GB

As „International business-information academy" Tuzla, has the ability to enroll new students into the study as a regular study, advanced study and distance learning study, we are able to track how many students visit our platform to study from all over the world. As we can see on the Figure 4. The highest number of students are in Germany and Bosnia and Herzegovina.

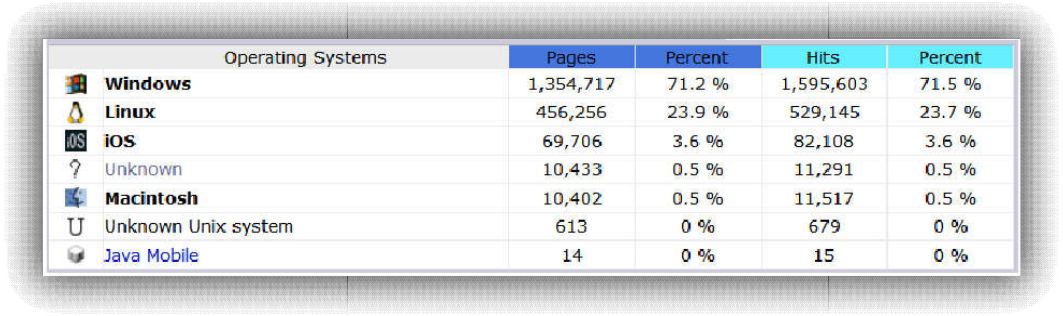
Fig 4. Countries that visit our portal



Locales		Pages	Hits	Bandwidth
Germany	de	812,894	944,828	59.25 GB
Bosnia-Herzegovina	ba	618,372	727,079	45.58 GB
United States	us	435,108	518,150	33.04 GB
Czech Republic	cz	10,743	12,213	544.03 MB
Slovenia	si	6,836	7,935	402.45 MB
Russian Federation	ru	3,109	3,454	200.25 MB
Italy	it	2,127	2,184	32.65 MB
Great Britain	gb	1,906	2,260	148.47 MB
Austria	at	1,485	1,794	188.32 MB
France	fr	1,452	1,739	378.33 MB
Netherlands	nl	1,064	1,389	91.92 MB
Croatia	hr	914	1,002	39.66 MB
Republic of Serbia	rs	722	771	26.58 MB
Israel	il	535	535	19.93 MB
India	in	448	448	9.58 MB
China	cn	410	427	19.65 MB
Canada	ca	375	407	19.54 MB
Switzerland	ch	222	248	12.73 MB
Australia	au	217	233	6.69 MB
Montenegro	me	205	221	8.45 MB
Brazil	br	199	199	3.81 MB
Philippines	ph	190	191	3.91 MB
Turkey	tr	161	167	4.13 MB
Poland	pl	132	132	2.56 MB
Ukraine	ua	132	136	3.67 MB
Others		2183	2216	48.71 MB

A few analysts break down student's activities in virtual learning condition and prescribe mentors essential arrangements, to present students individualized learning materials, (Romero,Ventura,Garcia,2008). Alltrought, not all colleges would analyze the statistics of operating systems used by the students, doesn't mean that it is less important. It can give us a preview of knowing which programs we can use in the classes and suggest students to learn code. As known, not all programs run the same way on all platforms. The most important thing for all professors is to know that all students are able to study and have all what they need installed at home.

Fig 5. Operating Systems used by our students



Operating Systems	Pages	Percent	Hits	Percent
Windows	1,354,717	71.2 %	1,595,603	71.5 %
Linux	456,256	23.9 %	529,145	23.7 %
iOS	69,706	3.6 %	82,108	3.6 %
Unknown	10,433	0.5 %	11,291	0.5 %
Macintosh	10,402	0.5 %	11,517	0.5 %
Unknown Unix system	613	0 %	679	0 %
Java Mobile	14	0 %	15	0 %

In this research, the clustering method was applied to study the learning behaviors of students. The result of clustering is subdivided of objects into separate groups of similar objects.Users, events, sessions, pages, activities, etc., might be as objects in distance learning. Awstats, Google analytics, and STATISTICA data mining and statistical analysis software were used for data clustering.
The most widely used K-means algorithm was applied. This algorithm clusters data according to formula:

$$J = \sum_{j=1}^{k} \sum_{i=1}^{n} \left\| x_i^{(j)} - c_j \right\|^2 \quad (1)$$

$\left\| x_i^{(j)} - c_j \right\|^2$ is a square of distance between the point $x_i^{(j)}$ and cluster centre, (MacQueen, 1967).

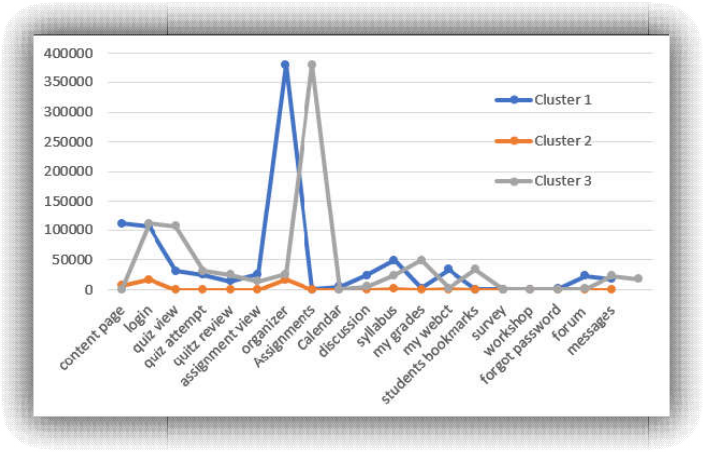
The data were grouped into 3 clusters and the results of this clustering are presented in Table 1.

Table 1. Results of clustering

Cluster	Amount	Percentage	Final evaluation
1	7	99.18928	7.568182
2	12	72.7571	7.836111
3	21	48.8703	7.604839

The data analysis represents the calculated number of students in each cluster as well as the average of their final evaluation, given by their final evaluation.

Fig 6.Clustering of students activities using the K-means alogrithm



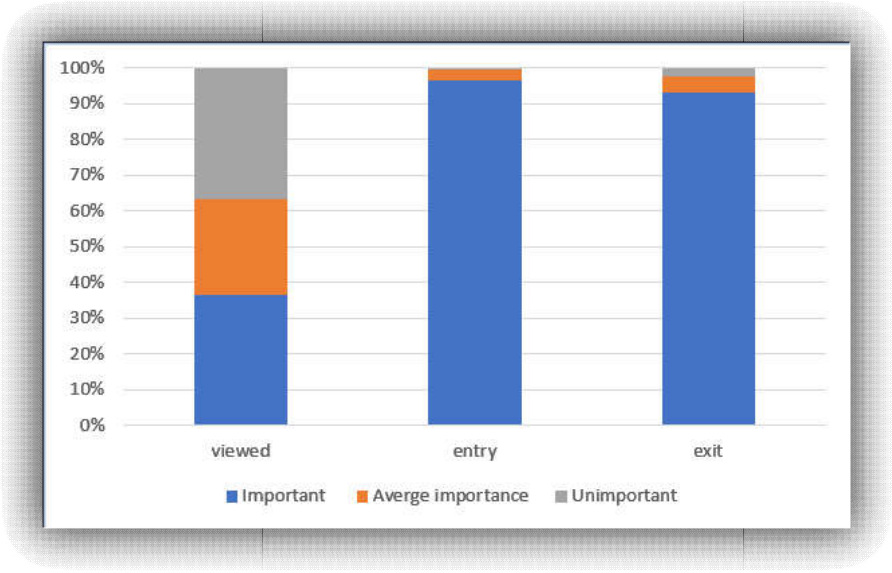
It is obvious that the average of final evaluation in cluster slight differs by from one another. With a view o archive more information, we have examined each cluster separately using additional criteria.As demonstrated in Figure 6, every one of the students from cluster3 are the most activestudents, spending most of their time in the VLE. Unfortunately, their final evaluation are lowest as compared to the other clusters even it is hardly noticable.So as to discover the reasons of this behavior, we need to make a deeperanalysis of data from the third cluster. Table 1 demonstrates the results of grouping VLE tools according to their influence on the nature of the studies.

Table 2. The influence of VLE on the quality of studies

Important	Average importance	Unimportant
content page	Assignments	my grades
login	Calendar	my webct
quiz view	discussion	students bookmarks
quiz attempt	syllabus	survey
quiz review		workshop
assignment view		forgot password
organizer		forum
		messages

Figure 7 indicates the time spent in the VLE by students from third cluster. It is obvious that most students enter only VLE tools: study materials, quiz, assignment, etc. The rest of the time they check their personal achievements, forum, messages, etc. Therefore a conclusion might be drawn that the high activity percentage of usingVLE is not a guarantee of a good study performance. Since a purposeful, logical usage ofthe important tools is an important criterion for course developers and instructors as well,a course instructor, having information about this criterion can optimize course navigation,the time spent by students in VLE and redirect student's work in a purposive way, instead,sometimes they use all possible tools without evaluating their usage possibilities and purposein general.

Fig 7.Analysis of students activities in cluster 3.



The largest student group is in cluster 1. The members of this cluster are most inactive VLE visitors, but the average of their final evaluation is the highest one. Again,with a view to explore these data, we have to make the statistical analysis of this cluster data. Using the important VLE tools for their studies, some students have spent more than 70–80% of their time. Only a small part of theirtime was spent for unimportant tools. Thus, it is possible to state that the students of the fist cluster use, study materials with exact predetermined aims. They did not spend their timebrowsing everywhere. On the contrary, they have found the necessary study materials andtools and used only them.

Since the learners are individuals, the best results could be achieved via the individualized teaching methods. Data mining methods can serve this purpose. Referring to the articles of the other authors and to the research made authors developed prerequisites for computer agents presenting individual materials for each learner, (Graf, Kinshuk, 2006). When preparing the study materials, course developers and instructors have to evaluatethe learners' group and to concentrate not only on the ways of traditional course presentation (materials prepared for printing, assessments), but also on stimulation of students ofthis group by involving them into active learning. This would let us to achieve better resultsand would not disappoint the students who choose virtual learning courses.

3.Conclusion

In e-learning a professor's role is very important. A professor influences the quality and the last consequence of the e-learning courseif the instructor is active in the study process, tracking students' activities, participating in students' discussions, promoting these discussions, then the

results of such a course are better than that of the neglectedstudents of courses.Having performed this research and processed its results we can conclude that distancelearning is a wide data mining application area. We went through k-means clustering method, where we divided the data into 3 clusters. We explained the behavior of the cluster. Since the professors are individuals the best result could be achieved via the individual teaching methods. Data mining methods can serve this purpose. Even in the case of excellent e-learning, the work on its preparation takes only about 30% of the total work in the course. The other part is qualitative course delivery qualified tutors, student involvement, etc.

In developing countries, such as those in the Balkans the use of e-learning is necessary. A lot of people are not able to attend the studies as a regular student, whether it is due to work or physical difficulties. If managed well, a virtual classroom can have constructive debates and discussions between students through real-time chat rooms. The most exciting aspect of distance learning is that it encourages collective thinking, socialization, and is by no means a lonely affair.

Those considering the negative aspects of distance learning say that the asynchronous nature of online education takes some getting used to, moreover conducting a seamless discussion might not be possible because it performs at various levels and speeds in different places. If a student is not familiar with technology, he might find it difficult to follow a discussion. Delayed responses and pending messages may further hinder group performance.

The requirement for further research investigating instructive impediment and varieties in Academic execution is undeniable, as various inquiries stay unanswered.This is partly due to the strict exclusion criteria that were used to make comparisons between students as fair as possible. Future studies should also focus on those students who entered university via non-standard routes and compare performance of studentswith different types of school qualifications.

An intelligent WEB system might be developed on the base of this research, using data mining methods, which, after analyzing the existing data. The WEB system could advance the learning procedure for understudies and show ways of accomplishing the best outcomes.

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Review paper / Pregledni rad

PROTECTION OF PERSONAL DATA IN CLOUD ENVIRONMENT - AUDITABLE STANDARD FOR CLOUD SERVICE PROVIDERS

Abstract

Any business entity outsourcing control of their data to a third party, whether cloud service provider or otherwise, is always well advised to undertake some level of due diligence prior to signing the contract to ensure that information security standards are as high as it is reasonable to expect given the commercial worth or personal sensitivity of the data. When personal data is involved due diligence in relation to information security is not just commercial common sense, but it is also a regulatory requirement. Data protection legislation in Bosnia and Herzegovina, as well as in many other countries, require that personal data controller must, where processing is carried out on his behalf, choose a processor providing sufficient guarantees in respect of the technical and organizational security measures governing the processing to be carried out, and must ensure compliance with those measures. The evaluation of potential cloud service providers ought to include a thorough review of their information security and privacy control environment. Audited compliance to a standard might be the appropriate method to ensure that data controllers comply with its data protection obligations and used by cloud service provider in order to reassure customers. This paper present an internationally accepted Code of practice for protection of personal data in public clouds acting as personal data processors.

Key words:*Cloud Computing, Data Protection, Audit, Compliance, Legal Requirements, ISO/IEC 27018, ISO/IEC 29100.*

1. Introduction

In accordance with the Stabilization and Association Agreement (SAA) between the European Communities and their MemberStates and Bosnia and Herzegovina, Bosnia and Herzegovina harmonize its legislation concerning personal data protection with Community law and other European and international legislation. Data protection legislation in Bosnia and Herzegovina, as well as in many other countries, require that personal data controller must, where processing is carried out on his behalf, choose a processor providing sufficient guarantees in respect of the technical security measures and organizational measures governing the processing to be carried out, and must ensure compliance with those measures. Consequences of noncompliance can be high. For example, Law on Protection of Personal Data in Bosnia and Herzegovina states that the controller shall be fined for violation in the amount ranging between 2,500 and 25,000 EUR if entrusts the processing of personal data to a data processor without a contract containing appropriate technical and organizational data protection elements (Official Gazette of Bosnia and Herzegovina, 2006). It should also be noted that new EU regulations in the field of personal data protection, with which domestic regulations will be harmonized, foresees significantly higher sanctions for violators (Hamidović, 2019) (Hamidović , 2018).

Law on Protection of Personal Data in Bosnia and Herzegovina state that „the data controller shall be liable if the damage to a data subject's rights foreseen by this law was caused by the data

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processor“ (Official Gazette of Bosnia and Herzegovina, 2006). According to international standard ISO/IEC 27018 “a public cloud service provider is a personal data processor when it processes personal data for and according to the instructions of a cloud service customer” (ISO/IEC, 2019). The same standard further emphasizes that “when the data processing is outsourced to public cloud service provider, the legal obligations with respect to personal data protection remain with the client of the cloud service” (ISO/IEC, 2019). That is, the user of cloud services will have to ensure that the cloud service respects the legal obligations associated with the storage, management and processing of personal data which it submits for processing (Hamidovic, 2014).

As Damen states “to ensure that there is no breach of its legal obligations, an organization will need to determine which cloud service providers will process personal data appropriately, in a way that

1. Organization can either trust the provider based on the contracts and underlying Service Level Agreements (SLA);

2. Organization can ask the provider to agree to grant it access to their premises, information and systems, in order to perform their own audits and assessments; or

3. The provider can provide organization with an assurance report compiled by an independent third party who did a security assessment” (Damen, 2014).

CEN, the European Committee for Standardization, states that although contracts have long been considered useful tools in achieving data protection compliance organizations can not rely solely on contracts and underlying SLA, but they must periodically check the compliance with the contract and legal provisions applicable to the processing (CWA, 2010).

Auditing security requirements in a cloud environment can be difficult and significantly challenging. When it comes to options that organization undertakes his own audits of Cloud Services Provider (CSP) activities Damen states that “the chances of a CSP opening up their doors to a prospective client to perform an assessment onsite are low. There are not many examples where a right to audit has been exercised successfully with a CSP. Not only is there but a slim chance of gaining a right to audit, the organization would need exceptionally capable technical auditors to assesses a cloud architecture that could be (and probably is) very different from traditional IT” (Damen, 2014).

This basically leaves an organization an option to contractually require and periodically receive from CSP a report of an investigation done by an independent external auditor regarding the compliance with the contract and implementation of appropriate technical and organizational security measures. Mitchell suggests that “one possible solution regarding this issue would be an auditable standard for cloud service providers which process personal data” (Mitchell, 2013). British standard on personal information management system BS 10012 specifies certification to ISO/IEC 27001 as one of the possible ways to demonstrate compliance with regulatory requirements for implementation of appropriate technical and organizational security measures (BSI, 2017) (ISO/IEC, 2013). “An auditor could verify whether a cloud provider meets the requirements of the standard and, if satisfied, it could issue a compliance certificate. This certificate could then be used both as a marketing tool for the cloud provider and as a simple way for a client to verify that a provider will meet their legal and regulatory obligations with respect to personal data processing. Furthermore, audited compliance to such a standard could be written into the contract for cloud service provision agreed between the cloud client and service provider”, says Mitchell (Mitchell, 2013).

In this article we will present ISO/IEC 27018 - an international Code of practice for protection of personally identifiable information (PII) in public clouds acting as PII processors, which might be used by cloud service provider in order to reassure customers.

2. Personal data protection requirements

The ISO / IEC 27018 standard developed by the International Organization for Standardization and International Electrotechnical Commission states as its scope "to establishes commonly accepted control objectives, controls and guidelines for implementing measures to protect Personally Identifiable Information in the public cloud computing environment, in accordance with the privacy principles stated in ISO/IEC 29100" (ISO/IEC,2014).

In accordance with ISO/IEC 29100 it "is essential that an organization identifies its requirements for the protection of personal data" **(**ISO/IEC, 2011).

The ISO / IEC 29100 standard further states that "three main sources of requirement are as given below **(**ISO/IEC, 2011):

a) Legal, Statutory, Regulatory and Contractual Requirements: One source is the legal, statutory, regulatory, and contractual requirements and obligations that an organization, its trading partners, contractors, and service providers have to satisfy, and their socio-cultural responsibilities and operating environment. It should be noted that legislation, regulations and contractual commitments made by the personal data processor may mandate the selection of particular controls and may also necessitate specific criteria for implementing those controls. These requirements may vary from one jurisdiction to another.

b) Risks: Another source is derived from assessing risks to the organization associated with personal data, taking into account the organization's overall business strategy and objectives. Through a risk assessment, threats are identified, vulnerability to and likelihood of occurrence is evaluated and potential impact is estimated. ISO/IEC 27005 provides information security risk management guidance, including advice on risk assessment, risk acceptance, risk communication, risk monitoring and risk review **(**ISO/IEC, 2018)

c) Corporate policies: Furthermore, while many aspects covered by a corporate policy are derived from legal and socio-cultural obligations, an organization may also choose voluntarily to go beyond the criteria that are derived from the requirements of a)."

Besides basing information security controls on applicable legal requirements, security standards and result of systematic security assessment, ISO/IEC 29100 states that results of a cost/benefit analysis is also important sources of requirement regarding the selection of security controls, that should not be neglected.

The use of a management system enables personal data controllers and processors to more effectively meet their privacy safeguarding requirements using a structured approach. This structured approach also provides personal data controllers and processors the ability to measure outcomes and continuously improve the management system's effectiveness.

3. Personal data protection controls

According to the International Organization for Standardization and the International Electrotechnical Commission "ISO/IEC 27018 is designed for organizations to use as a reference for selecting personal data protection controls within the process of implementing a cloud computing information security management system based on ISO/IEC 27001, or as a guidance document for organizations for implementing commonly accepted personal data protection controls" (ISO/IEC, 2019).

ISO / IEC 27018 further states "typically an organization implementing ISO/IEC 27001 is protecting its own information assets. However, in the context of personal data protection requirements for a public cloud service provider acting as a personal data processor, the organization is protecting the information assets entrusted to it by its customers. Implementation of the controls of ISO/IEC 27002 by the personal data processor is both suitable for this purpose and

necessary. However, ISO/IEC 27018 augments the ISO/IEC 27002 controls to accommodate the distributed nature of the risk and the existence of a contractual relationship between the cloud service customer and the cloud personal data processor. ISO/IEC 27018 augments ISO/IEC 27002 in two ways:
a) implementation guidance applicable to public cloud personal data protection is provided for certain of the existing ISO/IEC 27002 controls, and
b) Annex A provides a set of additional controls and associated guidance intended to address public cloud personal data protection requirements not addressed by the existing ISO/IEC 27002 control set" (ISO/IEC, 2019).

Thus for example, one of the public cloud personal data protection implementation guidance states that „in cases where individual cloud service customer audits are impractical or may increase risks to security, the cloud personal data processor should make available to prospective cloud service customers, prior to entering into a contract, independent evidence that information security is implemented and operated in accordance with the cloud personal data processor's policies and procedures. A relevant independent audit as selected by the cloud personal data processor should normally be an acceptable method for fulfilling the cloud service customer's interest in reviewing the cloud personal data processor's processing operations, provided sufficient transparency is provided." Furthermore standard states that "where possible, the event log should record whether or not personal data has been changed (added, modified or deleted) as a result of an event, and by whom.…The cloud personal data processor should define procedures regarding if, when and how log information can be made available to or usable by the cloud service customer. These procedures should be made available to the cloud service customer" (ISO/IEC, 2019).

4. Extended control set

According ISO / IEC 27018 "Annex A of ISO/IEC 27018 specifies new controls and associated implementation guidance, which in combination with the augmented controls and guidance in ISO/IEC 27002 make up an extended control set to meet the requirements for personal data protection which apply to public cloud service providers acting as personal data processors" (ISO/IEC, 2019).

These additional controls are classified according to the eleven privacy principles of ISO/IEC 29100 (ISO/IEC, 2011):
A.1 Consent and choice
A.2 Purpose legitimacy and specification
A.3 Collection limitation
A.4 Data minimization
A.5 Use, retention and disclosure limitation
A.6 Accuracy and quality
A.7 Openness, transparency and notice
A.8 Individual participation and access
A.9 Accountability
A.10 Information security
A.11 Privacy compliance

For instance, some of these additional ISO/IEC 27018 controls states that:

- "the cloud personal data processor should have a policy in respect of the return, transfer, and/or destruction of personal data and should make this policy available to the cloud service customer",
- "PII to be processed under a data processing contract should not be processed for any purpose independent of the instructions of the cloud service customer",
- "individuals under the cloud PII processor's control with access to PII should be subject to a confidentiality obligation",

- "the cloud PII processor should specify and document the countries in which PII might possibly be stored" etc. (ISO/IEC, 2019).

5. Privacy principles

ISO/IEC 27018 emphasizes that "in circumstances where the cloud data processor's determination of the processing method involves the collection and use of personal data, the cloud data processor should adhere to the relevant privacy principles set forth in ISO/IEC 29100" (ISO/IEC, 2019).

The privacy principles described in ISO/IEC 29100 standard were derived from existing principles developed by a number of international organizations. The following is a more detailed description of privacy principles in accordance with ISO/IEC 29100.

Consent and choice

According to ISO/IEC 29100, adhering to the consent principle means (ISO/IEC, 2011)(Yong-Sang Cho et al, 2015):

- presenting to the Personally Identifiable Information (PII) principal the choice whether or not to allow the processing of their PII except where the PII principal cannot freely withhold consent or where applicable law specifically allows the processing of PII without the individual's consent. The PII principal's choice must be given freely and on a knowledgeable basis;
- obtaining the explicit opt-in consent of the PII principal for collecting or otherwise processing sensitive PII except where (a) consent is not required by applicable law or (b) processing PII is prohibited by applicable law even with the PII principal's consent;
- informing PII principals, before obtaining consent, about their rights under the individual participation and access principle;
- providing PII principals, before obtaining consent, with the information indicated by the openness, transparency and notice principle; and
- explaining to PII principals the implications of granting or withholding consent.

According to ISO/IEC 29100, adhering to the choice principle means (ISO/IEC, 2011) (Yong-Sang Cho et al, 2015):

- providing PII principals with clear, prominent, easily understandable, accessible and affordable mechanisms to exercise choice and to give consent in relation to the processing of their PII at the time of collection or first use or as soon as practicable thereafter;
- informing PII principals about the consequences, if any, of withholding their consent in whole or in part; and
- implementing the PII principal's preferences as expressed in his or her consent.

Purpose legitimacy and specification

According to ISO/IEC 29100, adhering to the purpose legitimacy and specification principle means (ISO/IEC, 2011) (Yong-Sang Cho et al, 2015):

- ensuring that the purpose(s) complies with applicable law and relies on a permissible legal basis such as consent, a contractual obligation, or on another basis as provided in „Consent and choice" section above;
- communicating the purpose(s) to the PII principal at or before the time the information is collected or used for the first time for a new purpose, or as soon as practical thereafter;
- using language for this specification which is both clear and appropriately adapted to the circumstances; and
- if applicable, giving sufficient explanations for the need of processing sensitive PII.

Collection limitation

According to ISO/IEC 29100, adhering to the collection limitation principle means (ISO/IEC, 2011) (Yong-Sang Cho et al, 2015):

- limiting the collection of PII to that which is within the bounds of applicable law, and strictly necessary for the specified purpose(s).

Data minimization

ISO / IEC 29100 clarifies that data minimization is closely linked to the principle of „collection limitation“ but goes further than that. Whereas „collection limitation“ refers to limited data being collected in relation to the specified purpose, „data minimization“ strictly minimizes the collection of data in all phases of processing PII. (ISO/IEC, 2011)

According to ISO/IEC 29100, adhering to the data minimization principle means designing and implementing data processing procedures and ICT systems in such a way as to (ISO/IEC, 2011) (Yong-Sang Cho et al, 2015):

- minimize the PII which is processed and the number of entities and people to whom PII is disclosed or who have access to it; and
- use, or offer as default option, wherever feasible interactions and transactions which do not involve the identification of PII principals, reduce the observability of their behaviour and limit the linkability of the PII collected.

Use, retention and disclosure limitation

According to ISO/IEC 29100, adhering to the use, retention and disclosure limitation principle means (ISO/IEC, 2011) (Yong-Sang Cho et al, 2015):

- limiting the use, retention and disclosure (including transfer) of PII to that which is necessary in order to fulfil specific, explicit and legitimate purposes;
- limiting the use of PII to the purposes specified by the PII controller prior to collection, unless a different purpose is explicitly required by applicable law;
- retaining PII only as long as necessary to fulfil the stated purposes, and thereafter securely destroy or anonymize it; and
- locking (i.e. archiving and exempting from further processing) any PII when and as long as the stated purposes have expired, but where retention is required by applicable laws.

Accuracy and quality

According to ISO/IEC 29100, adhering to the accuracy and quality principle means (ISO/IEC, 2011) (Yong-Sang Cho et al, 2015):

- ensuring that the PII processed is accurate, complete, up-to-date (unless there is a legitimate basis for keeping outdated data), adequate and relevant for the purpose of use;
- ensuring the reliability of PII collected from a source other than from the PII principal before it is processed;
- verifying, through appropriate means, the validity and correctness of the claims made by the PII principal prior to making any changes to the PII (in order to ensure that the changes are properly authorized), where it is appropriate to do so;
- establishing PII collection procedures to help ensure accuracy and quality; and
- establishing control mechanisms to periodically check the accuracy and quality of collected and stored PII.

Openness, transparency and notice

According to ISO/IEC 29100, adhering to the openness, transparency and notice principle means (ISO/IEC, 2011) (Yong-Sang Cho et al, 2015):

- providing PII principals with clear and easily accessible information about the PII controller's practices, policies and procedures with respect to the handling of PII;
- including in notices the fact that PII is being processed, the purpose for which this is done, the types of entities to whom the PII might be disclosed, and the identity of the PII controller including information on how to contact the PII controller;
- disclosing the choices and means of processing offered by the PII controller to PII principals for the purposes of limiting the processing of, and for accessing, correcting and removing their information; and
- giving notice to the PII principals when major changes in the PII handling procedures occur.

Individual participation and access

According to ISO/IEC 29100, adhering to the individual participation and access principle means (ISO/IEC, 2011) (Yong-Sang Cho et al, 2015):

- giving PII principals the ability to access and review their PII, provided their identity is first authenticated with an appropriate level of assurance and such access is not prohibited by applicable law;
- allowing PII principals to challenge the accuracy and completeness of the PII and have it amended, corrected or removed as appropriate and possible in the specific context;
- providing any amendment, correction or removal to PII processors and third parties to whom personal data had been disclosed, where they are known; and
- establishing procedures to enable PII principals to exercise these rights in a simple, fast and efficient way, which does not entail undue delay or cost.

Accountability

In accordance with ISO / IEC 29100, the processing of PII entails a duty of care and the adoption of concrete and practical measures for its protection. Adhering to the accountability principle means (ISO/IEC, 2011) (Yong-Sang Cho et al, 2015):

- documenting and communicating as appropriate all privacy-related policies, procedures and practices;
- assigning to a specified individual within the organization (who may in turn delegate to others in the organization as appropriate) the task of implementing the privacy-related policies, procedures and practices;
- when transferring PII to third parties, ensuring that the third party recipient will be bound to provide an equivalent level of privacy protection through contractual or other means such as mandatory internal policies (applicable law may contain additional requirements regarding international data transfers);
- providing suitable training for the personnel of the PII controller who will have access to PII;
- setting up efficient internal complaint handling and redress procedures for use by PII principals;
- informing PII principals in a timely manner about privacy breaches that may lead to substantial damage to them (unless prohibited, e.g., while working with law enforcement) as well as the measures taken for resolution;
- allowing an aggrieved PII principal access to appropriate and effective sanctions and/or remedies, such as rectification, expungement or restitution if a privacy breach has occurred; and

- considering procedures for compensation for situations in which it will be difficult or impossible to bring the individual's privacy status back to a position as if nothing had occurred.

Information security controls

According to ISO/IEC 29100, adhering to the security controls principle means (ISO/IEC, 2011) (Yong-Sang Cho et al, 2015):

- protecting PII under its authority with appropriate controls at the operational, functional and strategic level to ensure the integrity, confidentiality and availability of the PII, and protect it against risks such as unauthorized access, destruction, use, modification, disclosure or loss throughout the whole of its life cycle;
- choosing PII processors that provide sufficient guarantees with regard to organizational, physical and technical controls for the processing of PII and ensuring compliance with these controls;
- basing these controls on applicable legal requirements, security standards, the results of systematic security risk assessments as described in ISO 31000, and the results of a cost/benefit analysis;
- implementing controls in proportion to the likelihood and severity of the potential consequences, the sensitivity of the PII, the number of PII principals that might be affected, and the context in which it is held;
- including reasonable organisational, physical, and technical means in the controls;
- subjecting the controls to periodic review and reassessment in an ongoing security risk management process; and
- ensuring that third parties such as PII processors to whom PII has been entrusted also implement appropriate controls as per the first listed item.

IS*O/IEC 29100 emphasizes that PII processors should take similar measures. (ISO/IEC, 2011)*

Privacy compliance

According to ISO/IEC 29100, adhering to the privacy compliance principle means (ISO/IEC, 2011) (Yong-Sang Cho et al, 2015):

- ensuring privacy compliance with relevant law and with their security, data protection and privacy policies and procedures;
- verifying and demonstrating that the processing meets data protection and privacy safeguarding requirements by periodically conducting audits by internal auditors or by trusted third-party auditors;
- having appropriate internal controls and independent supervision mechanisms in place that assure privacy compliance with relevant law and with their security, data protection and privacy policies and procedures;
- developing and maintaining privacy risk assessments in order to evaluate whether program and service delivery initiatives involving PII processing comply with data protection and privacy requirements;
- resolving risks and vulnerabilities that are discovered through privacy risk assessments and audit processes; and
- resolving privacy issues as they arise.

6. Conclusion

The increasing commercial use and value of personal data, the sharing of personal data across legal jurisdictions, and the growing complexity of ICT systems, can make it difficult for an organization to ensure privacy and to achieve compliance with the various applicable laws. In addition,

organizations must be able to demonstrate at all times that they have implemented appropriate measures to protect personal data.

New EU General Data Protection Regulation encourage the establishment of data protection certification mechanisms and of data protection seals and marks, for the purpose of demonstrating compliance with this Regulation of processing operations by controllers and processors. The use of international standards as a framework for the implementation and assessment of information security requirements has already been used by EU regulators in the telecommunications sector.

According to the International Organization for Standardization and the International Electrotechnical Commission "the intention of ISO/IEC 27018 is to create a common set of security categories and controls that may be implemented by a public cloud computing service provider acting as a personal data processor." These two international standardization organizations further clarify that ISO/IEC 27018 technical standard has the following objectives:

- To help the cloud service provider to comply with applicable obligations when acting as a personal data processor, whether such obligations fall on the personal data processor directly or through contract.
- To enable the cloud personal data processor to be transparent in relevant matters so that cloud service customers can select well-governed cloud-based personal data processing services.
- To assist the cloud service customer and cloud personal data processor enter into a contractual agreement.
- To provide cloud service customers with a mechanism for exercising audit and compliance rights and responsibilities in cases where individual cloud service customer audits of data hosted in a multi-party, virtualized server (cloud) environment may be impractical technically and may increase risks to those physical and logical network security controls in place.

Clients of the cloud service must be assured that cloud computing providers understand and properly manage the risks inherent in storing and running applications in the cloud. In relation to that, organizations should understand the importance of regular auditing the compliance of IT systems, which host their applications and data, to assess effectiveness in enforcing their corporate, industry or government requirements and policies. Some experts, like in the paper quoted Mitchell, correctly recommend that as a minimum, clients of the cloud service should demand to see a report of the cloud provider's operations by independent auditors. Given that ISO/IEC 27018 is built on the existing ISO/IEC 27001 security management system - the standard that cloud provider market already understands, invest in, and extensively implements, it should make the audits easier.

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PROTECTION OF INTELLECTUAL PROPERTY RIGHTS IN EUROPEAN UNION

Abstract

Intellectual property rights includes a system of legal instruments which regulating the way of acquiring intellectual property and a system of protection it from unauthorized use. In the business sense, intellectual property represents intangible assets whose successful exploitation can be a valuable foundation of business.The protection of intellectual property is necessary for the economic and social development.The aim of this paper is to draw attention on the importance of intellectual property in business negotiations. Intellectual property is area which allow better starting positions which ultimately means a more favorable price for the product which is a subject of business negotiations. The term intellectual property is generally thought of as comprising four overlapping fields of law: trademarks (protecting names, logos, symbols, and other devices indicating the quality and source of products and services); copyrights (protecting original works of authorship); patents (grants by the federal government allowing their owners to exclude others from making, using, or selling the owner's invention); and trade secrets (any commercial information that, if known by a competitor, would afford the competitor an advantage in the marketplace). This is very important for the economic and social development.

Key Words:*Intellectual Property, European Union, Law*

1. Introduction

Traditional forms of intellectual property have long been protected under copyright, patent, and trademark laws (Matsuura, 2003.). In order to understand rights and duties associated with control of intellectual assets, a basic understanding of fundamental principles of intellectual property law is required. The law of intellectual property balances the interests of the creators of intellectual property with those of the users of that property. The law provides developers of intellectual content with the exclusive right to exploit that content commercially. This grant of ownership is intended to provide creators of intellectual property with continuing economic incentive for future creative work. Intellectual property law also established certain limited rights of use (e.g., fair use) vested in the users of that property, which could not be eliminated by the creators of that property. This grant of rights to users of intellectual property was intended to promote rapid integration of creative works into new products, resulting in economic growth.

European intellectual property (IP) law and the intellectual property rights (IPRs) granted within the European Union (EU) do not exist in a legal void (Kurr et al., 2013.). Rather, apart from being regulated by European law in the form of Regulations, Directives and Recommendations, they are shaped by the rationale which underlies the grant of exclusive rights to holders of IPRs with regard to 'their' IP as well as by the international legal framework. The latter binds the national and the European legislature alike and thus defines their room for political and legal manoeuvre. Also, it contains the fundamental principles which enable a legal system which is still based on the principle of territoriality as developed in the 19th century to function in the increasingly globalised world of the 21st century.

The property aspect of immaterial goods that are protected by IPRs results from the fact that IPR legislation grants to the holders of IPRs the legal power to use and to exclude others from using the immaterial good in question in any way as defined by IPR legislation. In this way, IPRs in intangible objects are modelled after property rights in tangible objects. However, it should already

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be noted at this point that in spite of the similarities between property in tangible objects and IPRs protecting intangible objects, there are also differences, the most marked one of them being the limited time for which protection by IPRs is granted. Moreover, IPRs are much more concerned with balancing proprietary (exclusionary) and non-proprietary (non-exclusionary or access) interests than is traditional for property rights attached to physical objects. Hence, the property 'metaphor', although it has its justification in the exclusivity as the right's most distinguishing feature, is also somewhat limited and is even considered misleading by some commentators.

Although intangible in the physical sense, intellectual property has all the property characteristics (Pavišić et al., 2012.). It can be purchased, sold, licensed, replaced, donated, inherited as any other property. It follows from the foregoing that intellectual property is not a property of a material subject, but the right to an intangible object protected by the legal order of the country to the holder of intellectual property rights.

While property exists in almost all human groups, IP is essentially a peculiar institutional outcome of Western culture, and the recent proliferation of the literature justifying IPRs demonstrates that even in this specific legal culture, the concept behind it is not as trivial as it may seem (Ramello, 2008.). Rather, the design of a particular legal category for appropriating knowledge suggests that we are dealing with an idiosyncratic milieu, and what is standard elsewhere is not automatically transferable here. If one looks at the variety of IPRs and the differences in design, one can infer that knowledge is so different from the typical property subject matter that it requires distinct paradigms for its appropriation, which must be fine-tuned in order to obtain the expected outcome. In particular, the nature of knowledge and the specificity of its productive process must be taken into account.

Intellectual property is increasingly a global commodity (Seville, 2009.). Its intangible nature fits it perfectly for cross-border travel. Technologies of all kinds and in all fields have developed with almost incredible rapidity. As a result, many products of intellectual property may be readily enjoyed by users – both legitimate and illegitimate – all over the world. Intellectual property law has had to respond to these realities. Traditionally, intellectual property rights have been territorial in nature. In an economic world where trade is frequently international, and more and more commonly global, this fact gives rise to difficulties and conflicts between national systems. This engenders efforts towards cooperation and harmonisation at international levels, in an attempt to reduce obstacles to trade, and to increase the general international standard of protection for intellectual property. Such forces are not new; the Paris and Berne Conventions represent significant harmonisation efforts dating from the nineteenth century. However, the current economic significance of intellectual property rights results in evergrowing pressure for harmonisation. These may well be matters of great political importance and delicacy, not simply collections of rules which need tidying up. In some areas – such as patent litigation – there are identifiable, widely acknowledged problems.

The exploitation and protection of intellectual property is a crucial aspect of the EU's position in the global economy. The Commission has repeatedly emphasised the importance of these rights, which underpin innovation, employment, competition and thus economic growth. Community activity in this field is extensive. There are significant developments in high-level policy matters, and a continuing explosion of case law offering detailed interpretation of the wide range of harmonising measures. Some of these are traditional instruments, harmonising the laws of member states to remove barriers to trade. Many of these concern specific intellectual property rights (or aspects of them), although a few address horizontal aspects of this broad area of law, such as the enforcement of rights. There are also a number of schemes which create unitary systems for the protection of particular intellectual property rights, offering Community-wide protection via a single application. Important though strong intellectual property rights are to the Community, they must nevertheless be compatible with the Community's fundamental principles of free movement and competition. Unless the use of intellectual property rights is checked, their territorial nature will inevitably lead

to obstacles to free trade and free competition. The balance is continually contested, both within the single market, and at its borders.

There is an inevitable tension between the objectives of the European Union (EU), as defined and expanded in Arts 2 and 3 of the European Community (EC) Treaty, and national intellectual property law (Colston, 1999.). The EU aims at the establishment of a common market, and economic and monetary union. This is to be done, in part, by removing obstacles to the free movement of goods and services, and by a system ensuring that competition in the market is not distorted. The EC is founded on the philosophy that a free market is the most efficient (by keeping prices down, meeting consumer demand and inducing the production of new goods). Competition is self-destructive, in that it tends, eventually, towards the achievement of monopoly by the most competitive enterprise. Consequently, EU competition policy artificially maintains competition at the expense of monopoly. Intellectual property rights, on the other hand, confer either exclusive (copyright and unregistered design right, for example) or monopolistic (patents and registered designs, for example) property rights. These give right owners power to govern markets by preventing competition. Although these rights are designed to promote national industrial and technical development and economic progress, this is achieved at the expense of temporary market exclusivity. Intellectual property rights are also territorial in nature, allowing right owners to intervene in trade in their products and services across national borders by third party importers.

As a result of intensifying globalization and competitiveness on the world market, intellectual property is growing more important every day (Franjić, 2017.). Parallel to this, and requests subjects of international trade relations for the protection of intellectual property rights all the more pronounced. Therefore, in the legislation of individual countries, but also internationally, developed various forms of protection, intended mainly for holders of intellectual property rights. Exactly they can appear with your requirements in relation to goods which are the subject of international sale. In these circumstances an important role has responsibility for vendor rights and claims in the field of intellectual property.

The products of the human mind are intangible assets, whose value in duplication, use and presentation to other peoples, so they cannot be protected by hiding, imprisonment or other measures of physical protection (Franjić, 2015.). In order to protect this type of goods and thus stimulate human creativity that contributes to overall social development has developed an appropriate system of legal protection of intellectual property.

Unauthorized use or reproduction of the intellectual property is a violation of rights and the right of the owner to access, use and obtain the benefits, protects the assets and the institutions of the legal system.

2. Importance of Intellectual Property

The scope of IP has become increasingly multi-dimensional with the escalating need for protection in businesses and the constant stream of new issues under discussion (Yang, 2008.). For instance, there have been heated debates among scholars on the ethical issue of patent protection and access to drugs in poor countries; one-commerce and the whole Internet domain; and on ‘traditional knowledge’ and ‘expressions of folklore’. Some products raise the question of the need for protection across different IP rights. A typical example is computer programs and databases which may be protected by patents, trade secrets or copyrights depending on the country concerned. It has been said that ‘IP today is shorthand for a whole list of disparate rights that have this in common: they protect some products of the human mind, for varying periods of time, from others using those products in various ways’. Given the expansion of the scope of IP issues, there is ‘no single generic term that satisfactorily covers them all’.Hence, the discussion below cannot be exhaustive, but serves to emphasize and illustrate the most common forms of IP in terms of concepts, duration of protection, conditions for authorization of rights and any relevant sub-categorization.

Intellectual property is a very broad term that refers to a wide variety of intangible products of human creativity, inventiveness, and entrepreneurship (Tomkowicz, 2012.). For years it has been debated whether such intangible creations could be legally construed as a form of property, but today this designation is commonly accepted. While legal similarities and differences between intellectual property and classic, or tangible, property are numerous, one distinguishing characteristic is of particular importance: The existence of intellectual property is conceptually independent from the material form embedding the intangible aspect.

Intellectual property can be viewed as a structured system consisting of several segments. International treaties divide these segments into two categories: one category consists of copyrights and industrial designs; the other is comprised of patents, trademarks, trade names, geographical indications, and confidential information. This dichotomy reflects the historical development of international protection for intellectual property in international treaties and does not accurately refl ect the whole picture of intellectual property rights at the national level.

The term intellectual property is generally thought of as comprising four overlapping fields of law: trademarks (protecting names, logos, symbols, and other devices indicating the quality and source of products and services); copyrights (protecting original works of authorship); patents (grants by the federal government allowing their owners to exclude others from making, using, or selling the owner's invention); and trade secrets (any commercial information that, if known by a competitor, would afford the competitor an advantage in the marketplace) (Bouchoux, 2013.). Patents must be issued by the federal government, whereas rights in trademarks are created by use of marks, and rights in copyright exist from the time a work is created in fixed form. Nevertheless, registration of trademarks and copyrights offers certain advantages and benefits. Trade secrets are governed by various state laws, and registration is not required for existence and ownership of a trade secret. Trademarks and trade secrets can endure perpetually as long as they are protected, while copyrights and patents will fall into the public domain and be available for use by anyone after their terms expire.

Intellectual property poses a particular challenge for the European Union. The protection of intellectual property is seen as an essential element in the success of the single market: 'In our growing knowledge-based economies the protection of intellectual property is important not only for promoting innovation and creativity, but also for developing employment and improving competitiveness' (Seville, 2009.). On the other hand, to create a genuine single market in Europe, restrictions on freedom of movement and anti-competitive practices must be eliminated or reduced as much as possible, whilst maintaining an environment favourable to innovation and investment. The difficulty is finding the correct balance between competing demands.

Intellectual property is a state-created form of protection that provides IP owners with limited rights to determine how this knowledge may be used, including the right to buy or sell the IP (Haggart, 2017.). It commodifies knowledge. These rights, or privileges, allow for things such as music and drug formulas to be bought and sold, and limit the ability of others to use, or copy, these otherwise abstract ideas. In a market economy, the concern is that because it often takes a great deal of time and resources to come up with an idea, but it is relatively trivial to copy it, without some form of protection, there will be a suboptimal level of creation and invention. Consequently, intellectual property is designed to provide creators with certain rights that will allow them (potentially) to profit from their creation.

Intellectual properties are now at the very core of corporate success (Smith et al., 2005.). Properties such as patented technology and world-class trademarks are the basis for capturing huge market share, commanding premium prices, and maintaining customer loyalty. They are also in scarce supply. This combination of power and scarcity makes such assets very valuable. Companies that possess such assets will grow and prosper. Those without access to intellectual property will stagnate for a while in low-profit commodity businesses and eventually fade out of existence. Future success therefore requires that companies somehow gain access to intellectual properties.

They must create them, buy them, or arrange to borrow them. As a result, licensing and strategic alliances will play a dominant role in future corporate deal making. At the core of these strategies will be intellectual property—especially technology and trademarks.

Companies are seeking to expand product lines, increase market share, minimize new product development costs, expand market opportunities internationally, and reduce business risks. Companies are also seeking to create corporate value for investors. All of this can be accomplished by exploiting patents, trademarks, and copyrights. It is important also to consider the consequences of not having access to intellectual property. Without intellectual property, profits are low, growth is lacking, and corporate value is lost. Corporate managers realize more than ever that access to intellectual property is key to their ability to create corporate value and, more important, key to continued corporate survival. The forces driving the licensing and joint venturing of intellectual property include time savings, cost controls, and risk reduction.

Intellectual capital is recognized as the most important asset of many of the world's largest and most powerful companies; it is the foundation for the market dominance and continuing profitability of leading corporations (Ryder et al., 2014.).

Everyone involved with IP, whether for profit or not, needs to be able to measure what an IP asset is worth—in rupees or dollars! It has been noted that the valuation of intangible assets is "complex and widely misunderstood."1 It is important to understand and visualize valuation concepts because the valuation of IP serves as a measure of its influence on a corporation or the wealth of a nation. Valuation is a crucial tool in the strategic management of IP.

3. Trips

Before the TRIPS Agreement, international intellectual property rules were to be found largely in WIPO Treaties, such as the Paris and Berne Conventions. Although these had (and have) considerable merits as harmonising instruments, they were well understood to have significant shortcomings with regard to the enforcement of rights (Seville, 2009.). Detailed rules providing for the enforcement of rights in national courts simply did not exist. Nor was there any mechanism for establishing that states were in breach of their obligations, or for resolving disputes at state level. This was the background to the Uruguay Round of GATT. Although the inclusion of intellectual property in the negotiating mandate was a significant step forward, very considerable challenges still remained to be overcome. The text was signed at Marrakech in 1994 and entered into force on 1 January 1996. It is probably the most significant achievement in international intellectual property law of the twentieth century.

TRIPS sets normative standards for a wide range of intellectual property rights, including: copyright and related rights, trade marks, geographical indications, industrial designs, patents, plant varieties, layout designs of integrated circuits and trade secrets. In addition, an important set of provisions deals with domestic procedures and remedies for the enforcement of intellectual property rights.

The specific focus on that Agreement is warranted in part because of its paramount importance as a new universal convention which brings together under one roof all industrial law matters, combining Paris and Berne, the two great conventions from the end of the 19th century (Ghidini, 2010.). Thus – while superseding the former classical dichotomy between industrial and intellectual property – the Agreement sets out a common platform, of global reach, for the development of industrial and commercial activities based on the exercise of IPRs as a source of competitive advantage in international trade.

Moreover, TRIPs draws specific attention to the issue at stake. On one hand, as hinted, 'TRIPs is also a program of deep integration – harmonizing the policies and laws of developing countries with those of the global community – initiated by American multinational corporations and foreign policymakers'. On the other hand, when compared with more restrictive (regional and especially bilateral) Agreements bearing on IPRs, the TRIPs'multilateral character and 'administrative'system

(in particular as regards the resolution of disputes) translates into a relatively more balanced regulatory structure, which does – and can – put some limits on developed countries' capacity to easily impose harsher conditions on developing countries (DCs), while offering room for interpretation also aimed at mitigating the inherent disparity in bargaining power. On the contrary, such disparity is notoriously enhanced in plurilateral (sometimes regional) agreements and above all in bilateral ones – so-called Free Trade Agreements (FTAs), also referred to as TRIPs plus – in which Aesop's truth is only too well borne out.

The TRIPS Agreement is hardly the last word in international intellectual property lawmaking. Bilateral, plurilateral, and regional agreements, along with a multiplicity of training tools, guides, and resource books have followed in its wake. Intellectual property is a high-stakes commodity in the Knowledge Economy. Accordingly, this ferment in norm formation is unlikely to abate. Nations in the North with an interest in commodifying their knowledge-based output will continue to shop for (or create new) institutions that will endorse or develop higher standards of intellectual property protection, while those countries at the opposite end of the development spectrum will not abandon the search for fora more solicitous to user interests, distributive justice, health, and development. We have elsewhere proposed procedural and institutional mechanisms for integrating all of these activities into the TRIPS Agreement, including new approaches to interpretation of the Agreement. However, interpretive approaches can go only so far. They are essentially backwardlooking solutions; they do not preclude legal fragmentation and thus can only resolve the problems fragmentation produces. Yet coherence is essential to robust innovation: creativity cannot flourish without a greater degree of certainty than the current regime permits. Of course, absolute certainty is not realistic and, moreover, is less than ideal if national experimentation and cross-border trade are both valued.

4. Intellectual Property Rights and Modern Technologies

New technologies, for all their benefits for society and business, can upset the established patterns of production, distribution and consumption of goods. We need technology-friendly intellectual property policies. But designing such policies is far from easy. On the one hand, new technologies are helping the commercial, creative and cultural industries by opening up new streams of revenue from licensing and exploitation. E-commerce has made brand managers realise that trade marks, which were hitherto geographically limited to national markets, could now become global marks. This is all good for business, but the public can undoubtedly gain a great deal too. On the other hand, we see the confusion of European policy-makers with respect to computer software; infringement of copyright works in the digital environment seems impossible to stop; and there is frequent misappropriation of trade marks and their unauthorised use as domain names or meta tags. Such dilemmas are not new, dating at least as far back as when reprography and tape recording became cheap and easy, making the copyright laws seem obsolete to critics of the time. However, with the advent of the internet, the cacophonous discourse on the effects of technology on intellectual property rights has escalated many-fold.

A particular problem exists with regard to enforcing IPRs on the Internet (Kurr et al, 2013.). The problem has several facets. First, due to the multitude of possible infringers, it might not always be easy to detect infringement of IPRs on the internet. Second, because the internet eliminates physical distance, the act responsible for the infringement of domestic IPRs might be undertaken abroad, and indeed often is undertaken in faraway countries, where the infringer has little or no legal prosecution to fear. Third, even if an infringement is detected, it is not always easy for the holder of the infringed IPR to find out the identity of the infringer. Due to the possibilities to remain anonymous on the internet, all the IPR holder might have is an IP address of the infringer. This is particularly true regarding P2P file-sharing where IP addresses are often dynamic rather than static. Finally, the sheer mass of (infringing) transactions done over the internet pose a serious problem for law enforcement, not only for IPRs themselves, but likewise and in particular at the administrative level (courts; prosecutors' offices).

The crucial impact of intellectual property on all avenues of the human condition nowadays is the result of the technological revolution of the information age (Elkin-Koren et al., 2013.). Intangible goods, software, pharmaceutical drugs, music, books and movies are driving the economic growth in the 21st century. Intellectual property law has significant effects on the pace of this technological advancement and the technological revolution has no less significant effects on the scope and importance of intellectual property law. The growing economic value of informational goods brought about a process of commodification and propertization. Informational goods and services are increasingly protected as property, either by legal rules that grant the owner a set of exclusive legal rights, or by other means such as technology, which itself is protected by law against circumvention. The law became a major tool for economic gains and the immense economic potential of intellectual goods and their borderless nature has led to globalization of legal arrangements in this field. Intellectual property issues have also turned into trade issues, administered by the World Trade Organization.

The public domain is a key feature of this movement. The public domain consists of those aspects of intangible goods that are not subject to intellectual property. Over the past two decades scholars have emphasized the role of the public domain as a vehicle for promoting the goals of innovation and technological progress. Indeed, the public domain is not a graveyard of intellectual property laws, but rather its ultimate purpose. Intellectual property seeks to stimulate creative output and inventions that would ultimately be accessible to all, for the benefit of humanity as a whole. The public domain is also fueling innovation by providing the raw materials for further inventions and new creative works.

The expanding IT technology in all segments of social life has been strongly affirmed in the late XX. Century and early XXI. Century when IT became the main development lever not only in the economy but also in society as a whole (Franjić, 2018.). Global communications, e-business, and the Internet provide users a set of a wealth of benefits, and the most developed countries in the modern world create their own information society based on knowledge, information, entrepreneurship and innovation. Monitoring of modern world trends in the application of information technology has considerably enabled integration into the global economy. Traditional economic legitimacy is successfully adapted to the conditions that this new era demands.

IP has a huge impact on society as a whole (Franjić, 2016.a). Exploitation of intellectual property helps to create new jobs, provide protection to those new products placed on the market and, in general, affects the wellbeing of society, and this country seems more attractive for domestic and foreign investors.

On the other hand, failure to comply with intellectual property rights leaves behind a series of adverse consequences, such as deterring investors from potential investments, developments in crime, the loss of certain tax revenues and the stagnation of international trade. In the case of medical products, the consequences can be even more difficult because, as such, can have harmful effects on human health.

The impact of information technology on the structure and functioning of national economies and the entire world economy is reflected in the macro scale in the creation, development, and tumultuous growing significance of new industries, which directs the economic activities of mankind (Franjić, 2016.b). It can today be seen in the process of globalization. At the micro level leads to structural changes within the company that affect the activities of business functions or business processes as a fundamental determinant of business systems, not just those that are traditionally related to information flows. With it is developing the concept of decentralization of business decisions with an even share of the information and communication of all employees.

Classical economic thought emphasizes that the wealth of a nation depends on the method by which directs its resources, above all the material, the processes of production and trade. Better allocation

of these resources brings a higher level of productivity and result in a higher standard of living of individuals and society as a whole.

5. Conclusion

The development of intellectual and especially industrial property in the world as well as gained positive experiences in the practical use of its effects have resulted in the intellectual property of intellectually developed industrial systems becoming unquestionable and irreplaceable contemporary resource and resort of achieving global competitiveness and success in the market match not only on the global and regional level but also within the domestic contexts.The protection of intellectual property encourages creativity, but also economic activities. Intelllectual property is very important area of any national economy and this is imperative for economic and social development. Such circumstances certainly represent a powerful incentive for future scientific research.Since intellectual property is an extremely important part of any national economy, future scientific research in this area should imply a special elaboration of all aspects of intellectual property in concrete examples. They have a lot in all segments of each national economy, and the scientific elaboration of the first example will mean a lot to others. The fundamental question that arises in every sale is how to make the most profit. A quality answer to this question can give an economist, but also can give it a lawyer, and so it is be expected that quality results in future scientific research in the field of intellectual property will be provided by economic and legal scientists. Using results of scientific research could mean a good start in every business procedure.

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Professional paper / Stručni rad

EU GENERAL DATA PROTECTION REGULATION (GDPR) - ANONYMISATION AND PSEUDONYMISATION IN FUNCTION OF DATA PROTECTION

Abstract

By signing the Stabilization and Association Agreement, Bosnia and Herzegovina has taken obligation to align its legislation, which concerns the protection of personal data with the law of the Community and other European and international privacy laws. On May 25, 2018, EU General Data Protection Regulation (GDPR) entered into force in all the countries of the European Union. The protection of the rights and freedoms of individuals with regard to processing of personal data requires that appropriate technical and organizational measures be taken to ensure compliance with the requirements of this GDPR. As health care institutions deal with processing of data related to patient health, we are talking about the processing of special categories of personal data, on which GDPR attaches great importance. In this paper, general anonymization and pseudonymization procedures will be presented, which are recognized as useful protective mechanisms in the General Data Protection Regulation and as such should be used for the protection of data relating to patient health.

Key words:*Privacy, Data protection, GDPR, Anonymization, Pseudonymization, Personal data, Health data*

1. Introduction

Personal data related to health, according to many, are among the most trusted of all kinds of personal data. The European Court of Human Rights has issued a number of judgments against EU countries because they did not adequately protect the citizen's medical records and the confidential information it contains. Many data protection laws and the EU Regulation on the Protection of Individuals with regard to the processing of personal data require from data controller to implement appropriate technical and organizational measures for the protection of personal data. Personal health data is considered to be a special category of personal data, for which an additional level of protection is required under the data protection rules. (Hamidović, 2019) (Hamidović, 2018).

Being aware that in order to provide full protection of data relating to patient health, it is not sufficient to just establish legal rules, but that the controller must take real steps to prevent unlawful access or use of data, whether by accident or malice, the Council of Europe, in its Recommendation R (97) 5 on the protection of medical data, presented the basic technical and organizational steps that a medical institution should take to ensure data security. The Council of Europe's Recommendation states that such measures should ensure an adequate level of security taking into account, on the one hand, the technical situation and, on the other hand, the sensitive nature of medical data and the assessment of potential risks (Council of Europe, 1997) (Hamidovic, Kabil, 2013).

These measures should be periodically reviewed.

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Council of Europe Recommendation explicitly states that „in order to ensure in particular the confidentiality, integrity and accuracy of processed data, as well as the protection of patients, appropriate measures should be taken (Council of Europe, 1997):

a. to prevent any 220ttack220ation person from having access to installations used for processing personal data (control of the entrance to installations);
b. to prevent data media from being read, copied, altered or removed by 220ttack220ation persons (control of data media);
c. to prevent the 220ttack220ation entry of data into the information system, and any 220ttack220ation consultation, modification or deletion of processed personal data (memory control);
d. to prevent automated data processing systems from being used by 220ttack220ation persons by means of data transmission equipment (control of 220ttack220atio);
e. with a view to, on the one hand, selective access to data and, on the other hand, the security of the medical data, to ensure that the processing as a general rule is so designed as to enable the separation of:

- identifiers and data relating to the identity of persons;
- administrative data;
- medical data;
- social data;
- genetic data (access control);

f. to guarantee the possibility of checking and ascertaining to which persons or bodies personal data can be communicated by data transmission equipment (control of communication);
g. to guarantee that it is possible to check and establish a posteriori who has had access to the system and what personal data have been introduced into the information system, when and by whom (control of data introduction);
h. to prevent the 220ttack220ation reading, copying, alteration or deletion of personal data during the communication of personal data and the transport of data media (control of transport);
i. to safeguard data by making security copies (availability control).

In addition, controllers of medical files should, in accordance with domestic law, draw up appropriate internal regulations which respect the related principles in this recommendation, and, where necessary, controllers of files processing medical data should appoint an independent person responsible for security of information systems and data protection and competent for giving advice on these issues (Council of Europe, 1997).

Taking into account the unique challenges that the health sector represents, the International Organization for Standardization (ISO) also has presented guidelines for managing health information security using the ISO / IEC 27002 standard (ISO, 2016) (Hamidovic, Kabil, 2011).

In this paper, general procedures for anonymization and pseudonymization of data will be presented, which are recognized as useful protective mechanisms in the General Data Protection Regulation and as such should also be used to protect data related to patient health.

2. Data anonymization

Data anonymization is a process of processing personal data that irretrievably prevents the identification of an individual from the processed data (CARNET, 2018).
Take, for example, a set of data on visits to health care institutions containing records of:

- name and surname of the patient,
- the patient's address,
- the reason for his visit to the healthcare institution,

• the name of the health institution.

A simple example of anonymizing this dataset would be to remove information about the name, surname and address of the patient from each record (CARNET, 2018).

For example, if one record says it was

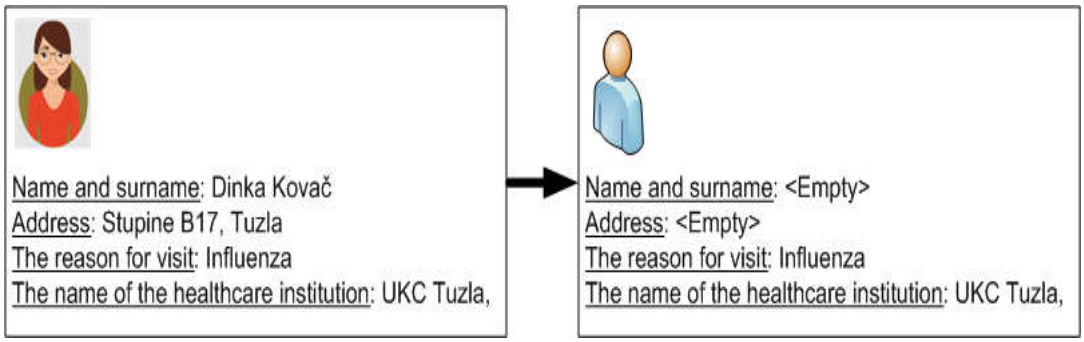
• patient Dinka Kovač;
• living on Stupine B17, Tuzla;
• due to influenza;
• was in the health institution UKC Tuzla,

after anonymization that record would only say that:

• some (anonymous) patient
• due to influenza
• was in the health institution UKC Tuzla.

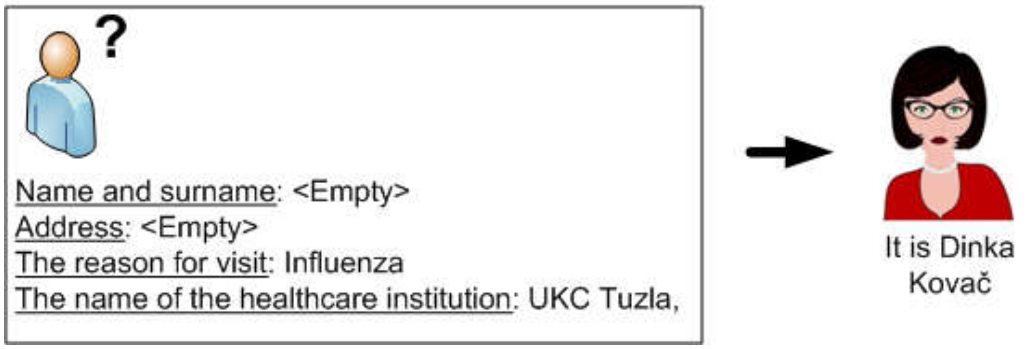
This example is illustrated in Figure 1.

Figure 1. A simple example of data anonymization



By definition, after proper anonymization, it must not be possible to associate anonymous information with a particular person. Using the previous example - it should not be possible to somehow reveal that Dinka Kovač was a patient who visited the UKC Tuzla health care institution because of influenza, as shown in Figure 2. In other words, it should not be possible to re-identify an individual from anonymised data (CARNET, 2018).

Figure 2. Linking data with a particular person

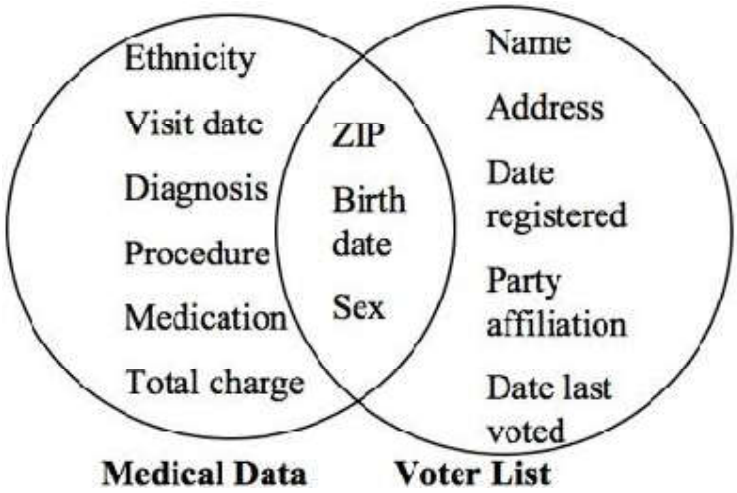


Pursuant to the General Data Protection Regulation properly anonymised data is no longer considered to be personal information within the meaning of GDPR: „*The principles of data protection should therefore not apply to anonymous information, namely information which does not relate to an identified or identifiable natural person or to personal data rendered anonymous in such a manner that the data subject is not or no longer identifiable. This Regulation does not*

therefore concern the processing of such anonymous information, including for statistical or research purposes."

Removing direct identifiers is necessary, but often not enough for complete anonymization of data. The literature cites the example of a re-identification experiment that was carried out in the late 1990s, when a private American company, active in the health sector, publicly announced an anonymised data set. This anonymization consisted of removing the name of the data subjects, but the data set still contained health information and other attributes such as the postal code (ID of the patient's place of residence), Sex and Full date of birth. The same triplet (Postal code, Sex, Full date of birth) was also included in other publicly available registers, such as a voter list, and therefore the researcher could use it to link the identities of certain data subjects with attributes in the published data set - Figure 3 (Article 29 Working Party, 2014) (Sweeney, 2000). The results of the study showed that as much as 87% of the US population can be identified using the above-mentioned combination of 3 data. Researcher Latanye Sweeney has thus discovered which records from an apparently anonymous database of health data belong to the then Governor of Massachusetts. She has successfully re-identified the governor's records by linking records from two different sources of data (CARNET, 2018).

Figure 3. Re-identification by data linking



Anonymization techniques

Article 29 Working Party on Data Protection in the document "Opinion 05/2014 on Anonymisation Techniques" lists as two main groups of anonymization techniques:

a) generalization and
b) randomization.

For both families of anonymization technique - generalization and randomization of data - is said to have certain disadvantages; however, each of them may be appropriate in the certain circumstances and context in order to achieve the desired purpose without compromising the privacy of data subjects"(Article 29 Working Party, 2014).

Generalization techniques are based on the generalization of the values of certain attributes. Using as the example data about visits to health care institutions, date of birth of the patient can be replaced by the year of birth of the patient (Figure 4), city of residence (eg. Tuzla) can be replaced by the region - Tuzla Canton and the like.

Figure 4. The generalization of the date of birth in the year of birth

Name and surname	Address	Sex	Date of birth	Reason for visit	Healthcare institution
		M	11.01.2006	Vomiting	Dom zdravlja Gračanica
		F	26.03.1997	Hornet sting	Dom zdravlja Gradačac
		M	13.08.1995	Influenca	Dom zdravlja Kladanj
		F	08.08.2008	Stab	Dom zdravlja Živinice
		M	12.12.1985	Cochlear implant surgery	UKC Tuzla

Name and surname	Address	Sex	Date of birth	Reason for visit	Healthcare institution
		M	2006	Vomiting	Dom zdravlja Gračanica
		F	1997	Hornet sting	Dom zdravlja Gradačac
		M	1995	Influenca	Dom zdravlja Kladanj
		F	2008	Stab	Dom zdravlja Živinice
		M	1985	Cochlear implant surgery	UKC Tuzla

After generalization, the same attribute value is shared by a larger number of people, which can make it much more difficult to re-identify people. In this technique, an important role plays degree of generalization. More general values can provide additional protection, but for legitimate purposes, they are less useful than more specific values because they provide less information (CARNET, 2018).

„Randomization is a family of techniques that alters the veracity of the data in order to remove the strong link between the data and the individual. If the data are sufficiently uncertain then they can no longer be referred to a specific individual. Randomization by itself will not reduce the singularity of each record as each record will still be derived from a single data subject but may protect against inference attacks/risks and can be combined with generalization techniques to provide stronger privacy guarantees. Additional techniques may be required to ensure that a record cannot identify a single individual.“ Examples of randomization techniques are(Article 29 Working Party, 2014):

- noise addition
- permutation

Noise addition technique changes the value of an attribute so that individual values are no more precise, but overall, values still have the same distribution (CARNET, 2018). In the example of visits to health institutions, it is possible to add or take to the patient's date of birth a few days as shown in Figure 5.

Figure 5. Adding noise by changing the date of birth

Name and surname	Address	Sex	Date of birth	Reason for visit	Healthcare institution
		M	11.01.2006	Vomiting	Dom zdravlja Gračanica
		F	26.03.1997	Hornet sting	Dom zdravlja Gradačac
		M	13.08.1995	Influenca	Dom zdravlja Kladanj
		F	08.08.2008	Stab	Dom zdravlja Živinice
		M	12.12.1985	Cochlear implant surgery	UKC Tuzla

Name and surname	Address	Sex	Date of birth	Reason for visit	Healthcare institution
		M	17.01.2006	Vomiting	Dom zdravlja Gračanica
		F	20.03.1997	Hornet sting	Dom zdravlja Gradačac
		M	23.08.1995	Influenca	Dom zdravlja Kladanj
		F	18.08.2008	Stab	Dom zdravlja Živinice
		M	17.12.1985	Cochlear implant surgery	UKC Tuzla

Permutation may be considered as a special form of noise addition. This technique, consists of shuffling the values of attributes in a table so that some of them are artificially linked to different data subjects, is useful when it is important to retain the exact distribution of each attribute within the dataset (Article 29 Working Party, 2014). Using as example data about visits to health care facilities, it is possible to do permutation of column of visited medical facilities and thus reduce the link between healthcare institutions and the rest of the record (CARNET, 2018), as shown in Figure 6.

Figure 6. Permutation of the name of a healthcare institution in a data set of visits to health care institutions

Name and surname	Address	Sex	Date of birth	Reason for visit	Healthcare institution
		M	11.01.2006	Vomiting	Dom zdravlja Gračanica
		M	13.08.1995	Influenca	Dom zdravlja Kladanj
		F	08.08.2008	Stab	Dom zdravlja Živinice
		M	17.08.1997	Cochlear implant surgery	UKC Tuzla

Name and surname	Address	Sex	Date of birth	Reason for visit	Healthcare institution
		M	11.01.2006	Vomiting	Dom zdravlja Kladanj
		M	13.08.1995	Influenca	Dom zdravlja Gračanica
		F	08.08.2008	Stab	UKC Tuzla
		M	17.08.1997	Cochlear implant surgery	Dom zdravlja Živinice

Although at first glance it seems that permutation completely destroys the link between the attributes and the rest of the record, this is often incorrect (CARNET, 2018). For example, after permutation in Figure 7, the fourth record states that the cochlear implants surgery was performed in the Dom zdravlja Živinice. However, this is a complex surgery operation that can only be done in Tuzla Canton in UKC Tuzla. In this case, even after this permutation, it is possible to conclude that the visit from the fourth record in Figure 6 was not done at the Dom zdravlja Živinice, but in UKC Tuzla.

3. Pseudonymization of data

General Data Protection Regulation recommends using pseudonymisation as a mechanism of protection of personal data: *"Taking into account the state of the art, the cost of implementation and the nature, scope, context and purposes of processing as well as the risks of varying likelihood and severity for rights and freedoms of natural persons posed by the processing, the controller shall, both at the time of the determination of the means for processing and at the time of the processing itself, implement appropriate technical and 224ttack224ational measures, such as pseudonymisation, which are designed to implement data-protection principles, such as data 224ttack224ation, in an effective manner and to integrate the necessary safeguards into the processing in order to meet the requirements of this Regulation and protect the rights of data subjects."*

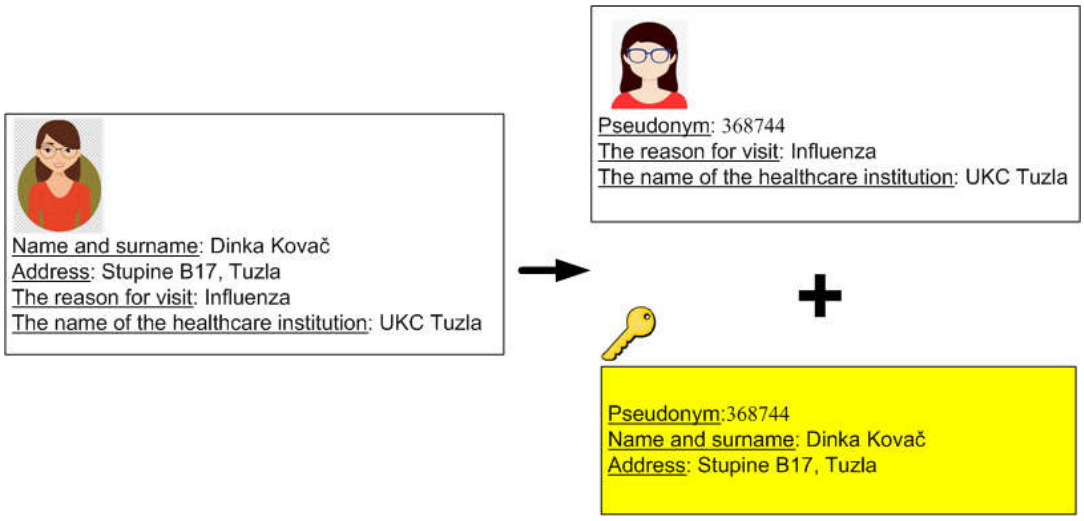
The Regulation states that „*pseudonymisation means the processing of personal data in such a manner that the personal data can no longer be attributed to a specific data subject without the use of additional information, provided that such additional information is kept separately and is subject to technical and 224ttack224ational measures to ensure that the personal data are not attributed to an identified or identifiable natural person*".

Simplified, pseudonymization is the process of processing data in which (CARNET, 2018):

- Direct identifiers are replaced by so-called. Pseudonym,
- while at separate (and more secure) place holds a table, or more generally, data linking pseudonyms and identifiers.

For example, pseudonymization of the data in the example of visits to healthcare facilities would have replaced the name, family name and address of the patient by random number. Thus, for example, "Dinka Kovač, Stupine B17, Tuzla" was replaced by 368744 (random number). Separated from these records would be a saved table linking pseudonyms (e.g. "368744") and direct identifiers (e.g. "Dinka Kovač, Stupine B17, Tuzla"). This example is illustrated in Figure 7.

Figure 7. Example of pseudonymization of data



It is crucial to understand that pseudonymization is not identical to anonymity. After pseudonymization of the data it is still possible to link pseudonymized data to a particular individual. Therefore, pseudonymized data continue to be considered personal data and are subject to protection obligations under the General Data Protection Regulation: „*The principles of data protection should apply to any information concerning an identified or identifiable natural person. Personal data which have undergone pseudonymisation, which could be attributed to a natural person by the use of additional information should be considered to be information on an identifiable natural person.*"

On the correctness of this GDPR regulation approach indicates a case from 2014, when the New York City Taxi and Limousine Commission published a data set of 173 million passenger taxi ride in New York during the previous year. In an attempt to de-identify the data set, the Commission replaced the medallion numbers and driver's license numbers with one-way cryptographic hash. The users of the data set discovered which hash algorithm was used and made identification in the way of testing all possible numbers of medallions and license numbers, determining cryptographic hash of each and replacing the hash with the original number (Garfinkel, 2015).

Pseudonymization techniques

Pseudonymization techniques can be classified, depending on how pseudonyms are generated, at (CARNET, 2018):

- Techniques in which the pseudonym is independent of the original data – e.g. tokenization and
- Techniques in which a pseudonym is generated from source data – e.g. pseudonymization by encryption or pseudonymization by a hash function

Tokenization is a pseudonymization technique in which the pseudonym, in this technique known as the token, is generated independently of the original data. For example, pseudonyms can be randomly generated numbers (CARNET, 2018). Thus "Dinka Kovač, Stupine B17, Tuzla" could be

replaced with a token (pseudonym) 368744. An example of pseudonymization by the tokenization is illustrated in Figure 8.

Figure 8. Example of pseudonymization by tokenization

Name and surname	Address	Sex	Date of birth	Reason for visit	Healthcare institution
Mehmed Ramić	Gračaničkih gazija bb, Gračanica	M	11.01.2006	Vomiting	Dom zdravlja Gračanica
Dinka Kovač	Stupine B17, Tuzla	F	26.03.1997	Hornet sting	Dom zdravlja Tuzla
Mirsad Memić	Fadila Kurtagića 203, Kladanj	M	13.08.1995	Influenca	Dom zdravlja Kladanj
Marina Tomić	Ulica oslobođenja bb, Živinice	F	08.08.2008	Stab	Dom zdravlja Živinice
Duško Obradović	VI bosanske brigade bb, Tuzla	M	12.12.1985	Cochlear implant surgery	UKC Tuzla

Token	Sex	Date of birth	Reason for visit	Healthcare institution
662234	M	11.01.2006	Vomiting	Dom zdravlja Gračanica
368744	F	26.03.1997	Hornet sting	Dom zdravlja Tuzla
223365	M	13.08.1995	Influenca	Dom zdravlja Kladanj
234122	F	08.08.2008	Stab	Dom zdravlja Živinice
112778	M	12.12.1985	Cochlear implant surgery	UKC Tuzla

Token	Name and surname	Address
662234	Mehmed Ramić	Gračaničkih gazija bb, Gračanica
368744	Dinka Kovač	Stupine B17, Tuzla
223365	Mirsad Memić	Fadila Kurtagića 203, Kladanj
234122	Marina Tomić	Ulica oslobođenja bb, Živinice
112778	Duško Obradović	VI bosanske brigade bb, Tuzla

When the data is correctly pseudonimized by the tokenization, it is not possible from pseudonym to get direct identifiers without using a table in which their links are written.

Pseudonymization by encryption is a pseudonymization technique in which identifiers are encrypted with a secret key and this encrypted value actually becomes a pseudonym (CARNET, 2018). In this technique, “Dinka Kovač, Stupina B17, Tuzla” would be encrypted and the encrypted value “EnCt2d80693bbfbac4de033eb ...” will be used as an alias. An example of pseudonymization by encryption is shown in Figure 9.

Figure 9. Example of pseudonymization by encryption

Name and surname | Address	Sex	Date of birth	Reason for visit	Healthcare institution
Mehmed Ramić | Gračaničkih gazija bb, Gračanica	M	11.01.2006	Vomiting	Dom zdravlja Gračanica
Dinka Kovač | Stupine B17, Tuzla	F	26.03.1997	Hornet sting	Dom zdravlja Tuzla
Mirsad Memić | Fadila Kurtagića 203, Kladanj	M	13.08.1995	Influenca	Dom zdravlja Kladanj
Marina Tomić | Ulica oslobođenja bb, Živinice	F	08.08.2008	Stab	Dom zdravlja Živinice
Duško Obradović | VI bosanske brigade bb, Tuzla	M	12.12.1985	Cochlear implant surgery	UKC Tuzla

Name and surname | Address	Sex	Date of birth	Reason for visit	Healthcare institution
2d50cff900e671A+yQlpt+FgH 8tebaRVwnqeLVBF5Xk2zfkRaJoPlws85hm0FauK7JsBY3Wbef	M	11.01.2006	Vomiting	Dom zdravlja Gračanica
fbac4de033eb223aPW1odN5eTQC M4qvbRVzNuQjbiyntlxWWMuXM0O1ZDKfOqUJSm+ZX0HXjWg	F	26.03.1997	Hornet sting	Dom zdravlja Tuzla
669f2cee3220fab0C5pWU5FX2AI opCvbRVxyQhfp4eES78R2C740ghoBqCyrc9PtpiCza6jlY91OMa	M	13.08.1995	Influenca	Dom zdravlja Kladanj
5470ed7968cd654dc=x7123hQmgI TqEnbRVzFYCTUt92cvlNbxhlnBH4y3KR4jTHHzqdOMyLfNnCq7	F	08.08.2008	Stab	Dom zdravlja Živinice
56ba5470b612ece59fwioXD9nyAC HxTLqRVzElGyO4mRIP1fnuuTJ+4trquJn9FkmOAQCz0Xq3hbN	M	12.12.1985	Cochlear implant surgery	UKC Tuzla

In this technique, there is no separate table that associates pseudonyms with identifiers, but separately is stored only the secret key that is used for encryption of identifiers. If a secure encryption algorithm and a secret key are used, then no pseudonyms can be accessed by direct identifiers without the knowledge of the secret key (CARNET, 2018).

In pseudonymization using the hash function, the identifiers are processed by the hash function and the hash function output is used as an alias.

Figure 10. Example of hash function

(Cisco, 2015)

In the technique of pseudonymization by compressing the record " Dinka Kovač | Stupine B17, Tuzla" would be treated with hash function and the output value "7f7b81d9f02216dfe6ff525cd3645ec8" will used as an alias. The example of pseudonymisation by compression function is shown in Figure 11.

Figure 11. Example pseudonymization by compression

Name and surname | Address	Sex	Date of birth	Reason for visit	Healthcare institution
Mehmed Ramić | Gračaničkih gazija bb, Gračanica	M	11.01.2006	Vomiting	Dom zdravlja Gračanica
Dinka Kovač | Stupine B17, Tuzla	F	26.03.1997	Hornet sting	Dom zdravlja Tuzla
Mirsad Memić | Fadila Kurtagića 203, Kladanj	M	13.08.1995	Influenca	Dom zdravlja Kladanj
Marina Tomić | Ulica oslobođenja bb, Živinice	F	08.08.2008	Stab	Dom zdravlja Živinice
Duško Obradović | VI bosanske brigade bb, Tuzla	M	12.12.1985	Cochlear implant surgery	UKC Tuzla

Hash function

Name and surname | Address	Sex	Date of birth	Reason for visit	Healthcare institution
3977d52838b33170b8e4df3d3e4a8aa3	M	11.01.2006	Vomiting	Dom zdravlja Gračanica
7f7b81d9f02216dfe6ff525cd3645ec8	F	26.03.1997	Hornet sting	Dom zdravlja Tuzla
cb9a03e01be969bc94666ecc43e2d0b6	M	13.08.1995	Influenca	Dom zdravlja Kladanj
bb8cbda498e6d57c1debb5de4546be10	F	08.08.2008	Stab	Dom zdravlja Živinice
a17c36ed5cea472f4de43f46db7765d1	M	12.12.1985	Cochlear implant surgery	UKC Tuzla

In pseudonymization by compression function typically are not used any separate data to associate pseudonym and identifiers, such as a table or secret key (CARNET, 2018).

The idea of pseudonymisation by the compression function is that, without the prior knowledge of the identifiers, it is not possible to find identifiers from the pseudonyms. But in practice, this is often not the case - with the known compression function, attackers can get identifiers behind by some of the pseudonyms by brute force 228ttack and similar techniques, as was the case of New York City Taxi and Limousine Commission. For this reason, various variants of pseudonymization with compression have been designed that have stronger protection features against re-identification.

These variants include (CARNET, 2018):

1. Salted hash function – Figure 12
2. Keyed hash function – Figure 13

Figure 12. Example of salted hash function

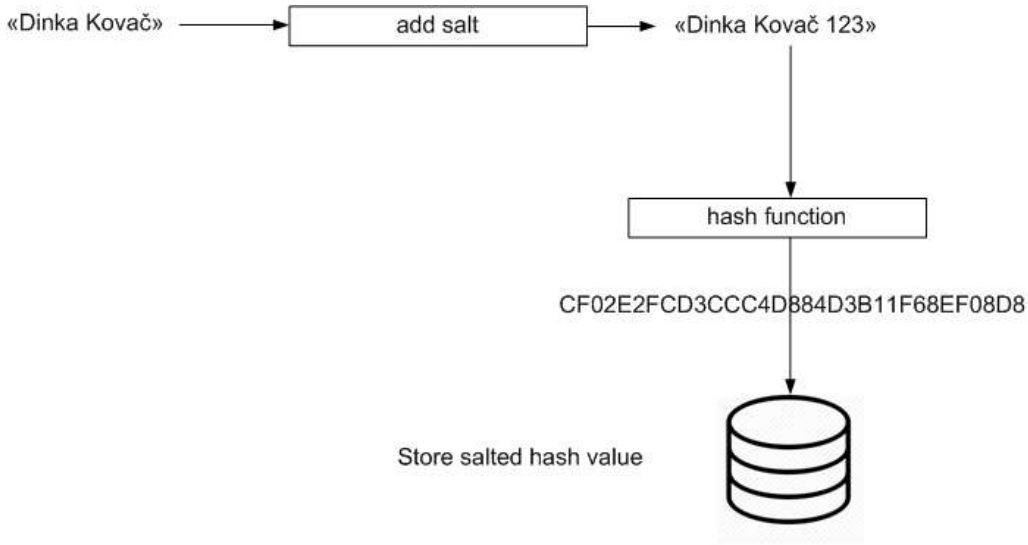
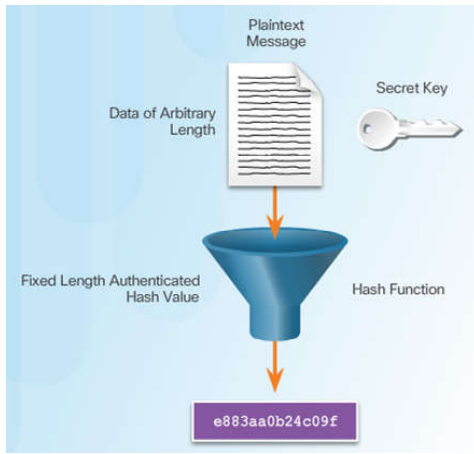


Figure 13. Example of keyed hash function



(Cisco, 2015)

4. Stanadrization activities

International Organization for Standardization – ISO and International Electrotechnical Commission – IEC in ISO/IEC 20889:2018 standard emphasize that the selection of de-identification techniques needs to effectively address the risks of re-identification in a given operational context. Furthermore, de-identification techniques are typically accompanied by technical and other organizational measures to enhance their effectiveness. ISO/IEC 20889:2018 provides an overview of core concepts relating to the de-identification of data, and establishes a standard terminology for, and description of, the operation and properties of a range of de-identification techniques. However, it does not specify how these techniques should be managed in a particular use case. It is anticipated that sector-specific framework standards will be developed to provide such guidance. (ISO/IEC, 2018)

In the context of the topic discussed in this paper, it is important to mention the norm ISO 25237:2017. This document provides a description of privacy-enhancing data de-identification techniques, to be used to describe and design de-identification measures in accordance with the privacy principles in ISO/IEC 29100. (ISO, 2017)

This is a very active area and in the coming period it is to expect new activities of international standardization organizations, academia, industry and others

5. Conclusion

Data controllers should take into account that an anonymous data set can still represent a residual risk for data subjects. Anonymization and re-identification are active areas of research and new discoveries are regularly published. Anonymization should not be considered as one-time activity and data controllers should regularly review the emerging risks. From case studies and research publications it is clear that creating a truly anonymous set of data from a rich set of personal data is not a simple task.

Pseudonymization techniques make it difficult for a person to be identified and thereby reduce potential damage if personal data collisions occur and that is why their benefit is recognized in the General Data Protection Regulation. With the introduction of the GDPR, the practice of treating pseudonymised data as anonymized will have to change, as it is, for example, in the case of certain projects in the field of healthcare. True anonymous data should not be able to be connected to individuals - which means that re-identification is not possible in any way - which is not the case if pseudonymization of the data is used.

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Review paper / Pregledni rad

E-GOVERNMENT MATURITY MODELS AND E-GOVERNMENT IN BOSNIA AND HERZEGOVINA

Abstract
In the contemporary digital society, e-government is one of the most rapidly evolving service domain. Many governments in developed and developing countries in the world have created e-government initiatives. Many authors, have been developed, different maturity models in order to better understand e-government evolution, and to assess or rank e-government portals. This paper aims to present e-government maturity models, and to identify their similarities and differences, as well as their weaknesses and strengths. This study examined the status of e-government in BiH and also conducted an in-depth literature review on e-government maturity models. Findings of our research show that the features included in those models differ from one to another. While some maturity models ignoring some features, it seems that others are just covering them and introducing new ones. Reviewing the status of e-government in BiH, showing that BIH has a solid ICT infrastructure, but there is a lack of political agreement on the further e-government development. Insufficient, not harmonized and not adopted legislation are slowing down development of e-government in BiH. The contribution of this paper is in simplifying work for researchers when choosing the right maturity model and to help BIH state government leaders in understanding e-government processes.

Key words*: E-government, e-government maturity models, e-government in BiH, ICT infrastructure, legislation.*

1. Introduction

Choosing the direction of digital transformation, communicating that vision, and justifying the necessary budget requests are the biggest new challenges for modern CIOs. This applies equally to public sector CIOs. Overcoming these challenges requires a step-by-step strategy that is both affordable and sustainable.

The adoption and use of electronic government (e-government) services in developing countries is still a big issue. A digital divide among the people, poorly offered e-government services, availability and access to the technology by the people are some of the critical issues faced with e-government projects. Anderson and Henriksen (2006) in their work stated that the e-government wave has caught the attention of not only the software and consultant industry, but also in the policy institutions, the public administration, and by an increasing number of researchers, at conferences, and workshops. Although there was solid research on IT in government during the 1970s, 1980s, and 1990s and limited new fundamental new research perspectives has been introduced with the e-government wave, there is a momentum and mass of researchers that could form the basis for breaking new research grounds in studying the new face of government. As part of the enthusiasm on IT in government, best practices and maturity models are being developed and applied to monitor whether governments are on the right track. So, the main benefit of those maturity models is to offer a way to rank e-government portals. Maturity models can also serve as a guide to help agencies enhance their e-government portal's quality. Joshi and Islam (2018) cite that the designs of

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e-government projects are driven by e-government maturity models, which are often called stage models. A maturity model is a conceptual framework that outlines how e-government projects should be assimilated in stages (Layne and Lee, 2001; Reddick, 2004). Considering the enormity and complexity of electronic government projects, it is often assimilated in stages (Fath-Allah, Cheikhi, Al-Qutaish and Idri, 2014). Several efforts have been made to standardize e-government assimilation stages and to measure the level of maturity that an e-government project has achieved (Andersen and Henriksen, 2006). This has resulted in the development of the several e-government maturity models (Kim and Grant, 2010).

While existing e-government maturity models have been adopted to develop strategic plans to deploy e-government projects, studies of Debri and Bannister (2015) and Ibrahem Zahran, Al-Nuaim, Rutter and Benyon (2015) have showed that an increasing number of e-government projects in developing countries are failing to align with the patterns of e-government maturity models, resulting in poor sustainability of these e-government services. The word sustainability has been loosely used to define the efficiency that a government could achieve in terms of cost, time, and effort to implement e-government services, while being able to accommodate the interests of various stakeholders (i.e., the government and citizens). Further assessment of e-government maturity models has brought forward several limitations to our knowledge, namely a lack of adoption (emphasis on technology), a linear pattern of stages, a lack of detailed processes, and a lack of state-of-the-art technology. Such limitations obstruct the design of sustainable e-government services, making it imperative to design alternative maturity models.

Al-Hashmi and Darem (2008) in their study stated that some books divides the process of e-government implementation into three phases, in the way to assist policymakers in devising their own plans and initiatives. These phases are not dependent on each other, nor need one phase be completed before another can begin, but conceptually they offer ways to think about the goals of e-government. Concha et al. (2012) divided e-government maturity models into the three types: the governmental models, the holistic approach models and the evolutionary e-government maturity models. In this study we are concerned about the third category which is the evolutionary e-government maturity models. Those models focus on the evolution of e-government using sequential steps, for instance from immature to mature e-government with improved quality. From an academic perspective, the most famous maturity models are – for example - the Layne and Lee (2001) model and the Andersen and Henriksen (2006) model.

So, many maturity models have been used to assess or rank e-government portals. In order to assess electronic services provided to the citizens, an appropriate e-government maturity model should be selected. This study aims at comparing 25 e-government maturity models to find the similarities and differences between them and also to identify their weaknesses and strengths. Another activity of this study is to review the status of e-government in BiH.

2. Overview of e-government maturity models

E-Government develops over time. Researchers want to track this, practitioners want to benchmark where they are in relation to others. The result has been the development of e-government maturity models. This section presents a findings about e-government maturity models:

Table 1.: Overview of e-government maturity models (Fath-Allah, Cheikhi, Al-Qutaish, and Idri; 2014)

MATURITY MODELS	MODEL STAGES	NOTES
Deloitte and Touche (2000)	• The 1st stage is "***information publishing***": The Web site at this stage serves as a static way to provide information. • The 2nd stage is "***official-two way transaction***": This stage features transactions and exchange of information between the citizens and the governmental agencies. • The 3rd stage is "***multipurpose portal***": The e-portal at this stage is a single point of entry to provide services to the citizen. • The 4th stage is "***portal personalization***": At this stage, the e-portal can be personalized according to the citizen's needs. • The 5th stage is "***clustering of common services***": At this stage, the services and processes are clustered to provide unified services to the customer. • The 6th stage is "***full integration and enterprise transaction***": At this stage, the e-portal is fully integrated and the services are personalized to customer needs.	The model was used in the following countries: Australia, Canada, New Zealand, the United Kingdom and the United States. The authors concluded that the majority of governments are at least in stage 1.
Gartner Group Open Governmen. Baum and Di Maio (2000)	• The 1st stage is "***Web presence***": At this stage, the Web site is static and used to provide basic information to the citizen. • The 2nd stage is "***interaction***": This stage features tools for interaction with stakeholders like search engines, documents downloading and emails. • The 3rd stage is "***transaction***": At this stage the user can perform complete transactions online. This includes payments like buying and selling. • The 4th stage is "***transformation***": At this stage, the processes are integrated and personalized.	
Layne and Lee (2001)	• The 1st stage is "***catalogue***": At this stage, the public authority is presented on the web. • The 2nd stage is "***transaction***": The citizen at this stage can make transactions with the government. • The 3rd stage is "***vertical integration***": This stage, involves integration with higher level systems within similar functionalities or jurisdictions. • The 4th stage is "***horizontal integration***": Systems at this stage are integrated across various government jurisdictions, the e-portals are real one stop shops for citizens.	Layne and Lee (2001) developed a four stages maturity model of e-government. The model is developed based on observations on e-government initiatives in the US.
Howard (2001)	• The 1st stage is "publish": At this stage, the government just publishes information about itself and its activities. • The 2nd stage is "interact": At this stage, the users can interact with the government via e-mails and chat rooms. • The 3rd stage is "transact": Where the users can complete transactions over the web.	
Hiller and Belange (2001)	• The 1st stage is "***information***": It represents the most basic form of Web sites i.e. posting information. • The 2nd stage is "***two way communications***": It involves communication between the citizens and the government. • The 3rd stage is "***transaction***": At this stage, online services and financial transactions are available for use by citizens. • The 4th stage is "***integration***": At this stage, all services are connected. A single e-portal can be used to access all e-government services. • The 5th stage is "***participation***": It features political participation, posting comments and voting.	

Wescott (2001)	• The 1st stage is "***setting up an email system and internal network***": This stage features e-mail systems to improve information sharing, coordination and feedback. • The 2nd stage is "***enabling inter-organizational and public access to information***": At this stage, information is department centric, shared between organizations and can be accessed by the public over the internet. • The 3rd stage is "***allowing 2-way communication***": This stage features online services. The citizens can make suggestions using emails or ask questions in forums and receive answers. • The 4th stage is "***allowing exchange of value***": This stage features applications such as tax assessments and license renewals. At this stage, the citizen can make secure payments on the Web. • The 5th stage is "***digital democracy***": This stage focuses on empowering the civil society (ex. Increasing awareness of government corruption) and allowing citizens to vote and express their opinions and feedback. • The 6th stage is "***joined-up government***": At this stage, citizens can execute services without knowing which government agency is responsible for. Vertical and horizontal integration is present at this stage.	Wescott developed a six stage maturity model of e-government that focuses on the development of e-government in the Asia-Pacific region. The authors concluded that most of the Asia-Pacific countries are still in the initial phases of e-government.
Chandler and Emanuels (2002)	• The 1st stage is "***information***": This stage features the availability of online information about government services and policies. • The 2nd stage is "***interaction***": This stage features basic level of interaction between governments and citizens such as email systems. • The 3rd stage is "***transaction***": At this stage, the user can conduct transactions online. • The 4th stage is "***integration***": This stage features integrated services across various departments and agencies.	
Moon (2002)	• The 1st stage is "***simple information dissemination***" (one-way communication): At this stage, governments are simply posting data and information on the Web sites. • The 2nd stage is "***two-way communication***" (request and response): This stage features an interactive mode between the governments and the stakeholders. Email systems and data transfer technologies are also present at this stage. • The 3rd stage is "***service and financial transactions***": At this stage, the users can execute self services with the possibility of electronic payments. • The 4th is "***integration***" (horizontal and vertical integration): This stage features horizontal and vertical integration which help data sharing between various departments. • The 5th stage is "***political participation***": This stage features surveys, forums and online voting. It also focuses on political activities.	The authors examined the current state of municipal e-government initiatives in the US based on data from 2000 e-government surveys for municipalities. The authors concluded that e-government was adopted by municipalities but it is still in an early stage.
Netchaeva (2002)	• The 1st stage features online Web sites with department information. • The 2nd stage features FAQs and email systems. • The 3rd stage features forums and opinion surveys. • The 4th stage features online services such as: license renewals and payment of fines. • The 5th stage features one stop shops. The citizens can vote, contribute in online discussions and make comments on policy and legislation proposals.	
	• The 1st stage is "***basic site***": At this stage, few pages are available in the Web site which give basic information about the agency. • The 2nd stage is "***electronic publishing***": At this stage, the	The UK National Audit Office [27] presented a report to the

UK model, N.A.O. (2002)	Web site contains many pages. • The 3rd stage is "***e-publishing***": This stage features personalization options and customizable search tools. Some forms can be submitted online and others can be downloaded. Moreover, at this stage there is an extensive use of emails and the responses are timely. Besides that, email alerts to notify the users about new content is an offered functionality. • The 4th stage is "***Transactional***": At this stage, the users make secure transactions over the Web. • The 5th stage is "***joined-up e-governance***": This stage features one stop shops and joined up governments (vertical and horizontal integration).	House of Commons, in which an e-government maturity model was developed using five stages.
Windley (2002)	• The 1st stage is "***simple Web site***": This stage features static pages with downloadable forms. • The 2nd stage is "***online government***": This stage features interaction mechanisms such as emails, Web forms, help and FAQs. • The 3rd stage is "***integrated government***": This stage features end to end transactions. Moreover, information is shared between departments at this stage. • The 4th stage is "***transformed government***": At this stage, the services are customer centric and organized according to citizens' needs and segmented according to population groups and life events. Vertical and horizontal integration is also present at this stage.	The model was applied to the 'Utah.gov' state portal in the US. The author concluded that the portal is solidly at the second stage of maturity.
Rohleder and Jupp (2003)	• The 1st stage is "***online presence***": At this stage, information is published online. • The 2nd stage is "***basic capability***": At this stage, security and certification is developed. The online presence is broad. • The 3rd stage is "***service availability***": At this stage, many services are available in the e-portal. This stage also features cross agency cooperation. Moreover, the services are designed to meet customer needs. • The 4th stage is "***mature delivery***": At this stage, the services are clustered. There is a clear ownership and authority – CIO (Chief Information Officer) or central agency. The customer is involved in the process of e-government and the services are marketed. • The 5th stage is "***service transformation***": At this stage, improved customer service delivery is the target. This stage also features multichannel integration.	The model was used to rank the following countries in e-government: Canada, Singapore, United States, Denmark, Australia, Finland, Hong Kong, United Kingdom, Belgium, Germany, Ireland, France, The Netherlands, Spain, Japan, Norway, Italy, Malaysia, Mexico, Portugal, Brazil, and South Africa.
World Bank (Toasaki (2003)	• The 1st stage is "***publish***": This stage features a variety of information published in the Web site. This includes rules, regulations, documents and forms. • The 2nd stage is "***interact***": In this stage, the users can provide feedback and submit comments on legislative or policy proposals. • The 3rd stage is "***transact***": In this stage, the users can complete secure transactions online.	
Accenture, Reddick (2004)	• The 1st stage is "***cataloguing***": At this stage, information about the government and its activities is presented on the web. • The 2nd stage is "***transactions***": At this stage, citizens can make transactions over the web. Furthermore, one stop shops are considered as a desired feature at this stage of maturity.	The model was used in the US context in examining the current stage of municipal e-government in the American cities. The author concluded that the G2C Websites are in the first stage of maturity.
	• The 1st stage is "***bill-board***": At this stage, Web sites are just	West's maturity model was used in a content analysis of US state and federal

West (2004)	billboards mainly used for posting information. • The 2nd stage is "***partial-service-delivery***": At this stage, users have the ability to search for data via search engines with limited online services. • The 3rd stage is "***portal or the one stop shop portal***": At this stage, all information and services are located in a single place. • The 4th stage is "***interactive democracy***": The e-portal at this stage offers personalization, push technology and feedback forms.	governmental Web sites. This included 1,813 government Web sites in 2000, and a follow-up study of 1,680 government Web sites in 2001. The authors concluded that many government agencies have mastered the first and second stage, while few government Web sites have achieved the 3rd and 4th stage.
Siau and Long (2005)	• The 1st stage is "***Web presence***": Web sites at this stage contain only static information. • The 2nd stage is "***interaction***": This stage provides a simple interaction like forms download and features basic search engines and email systems. • The 3rd stage is "***transaction***": In this stage, the users can perform complete transactions over the web. • The 4th stage is "***transformation***": This stage includes vertical and horizontal integration. The governments provide a single unified e-portal. • The 5th stage is "***e-democracy***": This stage features tools for online voting, polling and surveys to enable political participation and citizen engagement.	
Andersen and Henriksen (2006)	• The 1st stage is "***cultivation***": At this stage, horizontal and vertical integration is present along with the use of intranet by governments. • The 2nd stage is "***extension***": At this stage, there is an extensive use of intranet. The stage also features customized Web interfaces and extensive use of intranet. • The 3rd stage is "***maturity***": At this stage, there is an abandoning of intranet. The organization is mature and the processes are transparent. • The 4th stage is "***revolution***": At this stage, data can be shared between organizations and also applications can be shared across vendors.	Andersen and Henriksen (2006) developed a four stage maturity model of e-government. The maturity model was used in Denmark in an assessment of 110 state agencies. The authors noticed low scores for Danish agencies.
Cisco (2007)	• The 1st stage is "***information interaction***": This stage features departmental Web sites, legislative posting, public notices, online forms, webcasting and personalized e-portals. • The 2nd stage is "***transaction efficiency***": it is a citizen self-service e-portal that can include electronic payments like online taxes and e-procurement. • The 3rd stage is "***transformation citizen centric***": The administrative services at this stage are consolidated and shared across various government jurisdictions.	
Almazan and Gil-Garcia (2008)	• The 1st stage is "***presence***": At this stage the Web site contains static and limited information. • The 2nd stage is "***information***": At this stage, information is frequently updated and there is a greater number of available webpages. • The 3rd stage is "***interaction***": At this stage, the users can download forms and communicate with the government by mail. • The 4th stage is "***transaction***": This stage features secure online Web services with the possibility of payments. • The 5th stage is "***integration***": This stage offers a one stop shop to the citizens. • The 6th stage is "***political participation***": At this stage users can vote and participate in opinion surveys and public	Almazan and Gil-Garcia developed a six stage maturity model of e-government. The maturity model was used in Mexico in a systematic analysis of 32 state portals. The authors concluded that Mexican state portals are in the initial stages of electronic government. Besides that the authors provided weaknesses of those e-government portals.

	forums.	
Shahkooh, Saghafi and Abdollahi (2008)	• The 1st stage is "***online presence***": At this stage, information is published online. • The 2nd stage is "***interaction***": At this stage, citizens can interact with governments by emailing officials and downloading forms. • The 3rd stage is "***transaction***": The users at this stage can conduct secure transactions like payments and tax filling. • The 4th stage is "***fully integrated and transformed e-government***": At this stage government services are organized as a single point of contact. • The 5th stage is "***digital democracy***": This stage features online voting, public forums and opinion surveys.	
Kim and Grant (2010)	• The 1st stage is "***Web presence***": This stage features simple and limited information available on the web. • The 2nd stage is "***interaction***": This stage features search engines and downloadable forms. • The 3rd stage is "***transaction***": This stage features online transactions with the possibility of electronic payments. • The 4th stage is "***integration***": This stage features horizontal and vertical integration. Moreover, performance can be measured at this stage using statistical techniques. • The 5th stage is "***continuous improvement***": This stage features political activities. Besides that, there is a great focus on continuous improvements.	
Chan, Yan and Mingins (2011)	• The 1st stage is "***catalogue***": At this stage, there is an online presence on the web. The stage features presentation catalogue and downloadable forms. • The 2nd stage is "***transaction***": This stage features working databases supporting online transactions. Services and online forms are also made available at this stage. • The 3rd stage is "***vertical integration***": This stage features vertical integration with higher levels within similar jurisdictions.	The model was proposed based on theoretical research and the authors' experience in China's regional e-government.
Alhomod et al. (2012)	• The 1st stage is "***presence on the web***": At this stage, the e-portal provides only information. • The 2nd stage is "***interaction between the citizen and the government***": At this stage, the user can download and email forms to the concerned authority. • The 3rd stage is "***complete transaction over the web***": At this stage, citizens are able to complete entire tasks over the internet. • The 4th stage is "integration of services": At this stage, various departments share information with each other.	
Lee and Kwak (2012)	• The 1st stage is "initial conditions": This stage is a one way static interaction with the citizen. It is only used for broadcasting information to the public. • The 2nd stage is "data transparency": At this stage, the use of social media is limited. Feedback is get from the public on usefulness and data quality. • The 3rd stage is "open participation": This stage features social media tools to increase open participation. Input from the public is welcomed and used in policy decisions. This stage includes also e-Voting and e-Petitioning. • The 4th stage is "open collaboration": This stage features interagency collaboration by sharing data and public input. Public contests are organized and data is analyzed for obtaining new insights and improving decision-making. • The 5th stage is "ubiquitous engagement": At this stage, data	Lee and Kwak proposed a five stage maturity model of e-government which focus on open government and the use of social media and Web 2.0 tools. The model was developed based on case studies from US Healthcare Administration agencies.

	is easily accessed by mobile devices and tablets. Data is vertically and horizontally integrated. Besides that, data analytics is used for decision making processes. The agencies are focused on enabling continuous improvements.	
United Nations (2012)	• The 1st stage is "***emerging information***" services: In this stage, e-government Web sites provide static information. • The 2nd stage is "***enhanced information services***": In this stage, the presence is enhanced with one way or simple two way communication. • The 3rd stage "***transactional services***": In this stage, a two way interaction with citizens is possible. • The 4th stage is "***connected services***": In this stage, Web sites are proactive in requesting citizens' feedback via Web 2.0 tools. Government agencies are citizen centric and services are customer centric.	The United Nations developed a four stage maturity model of e-government. The maturity model was used for ranking the UN member states.

2.1. Evaluation and comparison of maturity models

The comparison conducted in this study takes a 25 e-government maturity. Moreover, this study highlighted 4 main issues related to the e-government maturity models: Maturity models' stage names, Maturity models' stage numbers, year and country, Maturity models' stage focus and Maturity models' stage features.

From the investigation of this study, the 25 e-government maturity models stage names are different from one maturity model to another; their content may have some similarities and differences. For instance, the first stage for Layne and Lee is named "Catalogue" where the public authority is presented on the web, while for United Nations this stage is named "Emerging information services" where government websites provide static information, and for Lee and Kwak (2012) this stage is named "Initial conditions" and is about broadcasting information to the public.

Analyzing the all maturity models, authors concluded there are large similarities between them; for example, large similarities existing between the Moon's model and the Hiller and Belanger's one as stated in Karokola and Yngstorm (2009) study. Andersen and Henriksen (2006) stated that the Layne and Lee model focuses more on the bias of the international institutions promoting e-government. They argued that e-government should move beyond the actual benefits it is making and focus more on reaching the citizen in a more efficient way. For this purpose, Andersen and Henriksen see that the first stage should include horizontal and vertical integration Andersen and Henriksen (2006). However, this is an advanced feature and should be considered at the last stages like in the other maturity models.

From Table 1. We can see that almost all of the maturity models focus on presence in the first stage. Furthermore, interaction is present at stage 2 and 3. Other than that, transaction is present at stage 2, 3 and 4. Moreover, integration and advanced features such as: transformation, e-participation and political participation are all present in the final stages 3, 4, 5 and 6. What can be concluded is that the most important stages of maturity can summarized into the following: presence, interaction, transaction and integration.

Regarding the maturity models' stage features, most of the e-government maturity models have been built without any input from the others, with the exception of Almazan and Gil-Garcia, Shahkooh et al., Siau and Long, and Kim and Grant maturity models. In such situation, different terms have been used to express the same features, or similar feature has been expressed in different terms. Therefore, bringing a convergence and consensus on maturity models features would facilitate both the built and the use of the maturity model. Moreover, while some features are included in most of the maturity models such as interoperability (20 maturity models), payment and e-participation (17 maturity models), there are other features that are covered by few maturity models such as customer centricity (6 maturity models) and personalization (8 maturity models). It is clear that the focus of the studied models differs from a maturity model to another. While, some

maturity models are covering some features and introducing new ones, it seems that others are just ignoring them. Besides that, there are some new features such as measuring performance and analytics for decision making introduced by the Lee and Kwak model and not raised by the other maturity models (Fath-Allah et al.; 2014).

Therefore, considering none of the models as universal, all the above authors developed their own versions of maturity models. All the mentioned existing works are important and have already contributed to e-government implementation. However, several limitations were identified by various researchers, such as: Almost all electronic government maturity models agreed that the assimilation of electronic governments occurred in a linear manner where the e-government project progressed from simple to complex technology (Abdelghany et al.; 2016). The models introduced by Layne & Lee (2001), Gartner (Baum and Maio; 2000), the United Nations (UN) (2012), Reddick (2004), and West (2004) argued that an additional stage needed to be completed before starting the following stage. This may have been partially true; however, modern technology could enable governments to initiate two or more stages simultaneously (e.g., governments could introduce e-governments along with their integration into the government department (Rana et al.; 2015). This depends on the government's decision whether or not it has enough resources to start two stages (e.g., introduction and integration) simultaneously.

Some existing electronic government maturity models rank the maturity of electronic governments based on the technology in use (Napitupulu and Sensuse; 2014). Almost all maturity models agreed that governments using sophisticated and advanced technology achieved greater levels of electronic government maturity. The success of e-governments should not be measured merely based on sophistication of the technology used by the government, but instead, should also consider whether or not the services offered are being used by the stakeholder (Debri. And Bannister; 2015). These limitations can be considered as the determinants of sustainable e-government services, as they impact the whole e-government project.

3. E-government in Bosnia and Herzegovina: An short overview

One of the most frequently asked questions about electronic government, or e-Government is: What does e-Government exactly mean? Especially in Bosnia and Herzegovina (BiH), since the study and practice of electronic government is just beginning, it is difficult to reach a precise definition, and those who deal with it will certainly discuss what exactly this term means. One thing we are sure is that the electronic government should be much more than buying the latest computer equipment or selective release of some information on the web sites of government agencies.

Bosnia and Herzegovina started the process of introducing e-Government with the adoption of Information Society Development Policy and Strategy by the Council of Ministers (CoM) of BiH in November 2004. The documents were complemented with the Action plan consisting of a number of precise projects and goals and, in that moment, it seemed that preconditions to approach a more serious development of the information society in general and specifically e-Government were set.

The following effort came with the ongoing Public Administration Reform (PAR) project which incorporated some of the policies and actions stated in previously mentioned documents. The Strategy and Action plan for PAR was adopted in 2006, again by the CoM BiH, with the aim to reform the Bosnian public administration and substantially improve it by 2016. This reform project is very much devoted to pave the way for the integration of BiH into the European Union (EU). PAR project is grounded in a vision to develop a public administration that is more effective, efficient, and accountable; that will serve the citizens better for less money; and that will operate with transparent and open procedures (PARCO, 2006). The project seems to provide a great opportunity for e-government development in BiH, especially considering the overall PAR goal of complying with "all conditions set by European integration process" on one side, and the known level of e-Government sophistication in Europe, on another.

Bosnia and Herzegovina is still living the consequences of the horrible war that happened in the early 1990s, it is established as a complex state, composed of two entities to which, later on, following the international arbitration decision, one district was added as an independent administrative unit within Bosnia and Herzegovina. Such complex constitutional set-up combined with unclear division of competences is additionally burdened by the different political agendas of the entities. While one entity would like Bosnia and Herzegovina to be as much decentralized as possible so BiH to become a confederation of two entities; the other one would like to see more centralized and streamlined constitutional set-up with a stronger government on the national level. The state institutions of Bosnia and Herzegovina are caught in the middle of disputes coming from both sides so that limited powers which they exercise are strongly influenced by the two different political agendas coming from the entity level. Although with limited powers, Bosnia and Herzegovina still has more than 70 institutions on the state (national) level with some 10.000 employees. One of the first questions to be asked to employees of BiH state institutions is certainly one considering their understanding of the term "e-government". There can't be capacities to build e-government if the government doesn't understand the true meaning of that term. The Information technology team in public administration review findings showed that in administrations at all levels of BiH, there was a weak understanding of the role that IT can play in public administration reform and of the improvements it can bring [(PARCO, 2006). While we know that the success of e-government depends on the right combination of many different factors: innovative ICT, leadership and vision of public managers, re-organization and process reengineering, etc.; the introduction of IT in the BiH public administration was still treated merely as the computerization of government operations and not as a tool in an overall government reform. That lack of political awareness, vision and leadership contributed to the lack of a systemic, organized and methodological approach to the use of ICT in the public administration and it is not surprising that BiH was one of the last countries in the Balkan region to adopt a countrywide IT strategy (Heeks, 2006).

Almost three decades later, we still have no major improvements in e-government development in state institutions of Bosnia and Herzegovina. The adoption and implementation of some e-government projects has gradually started in the state institutions of BiH. Bosnia, as a post-conflict society, receives a lot of attention by international development agencies and donors. Thanks to their efforts and efforts of some e-Government leaders in state institutions, there are already significant number of e-government projects and initiatives. Despite of the increasing in the number of e-government projects and budgets there are no official guidelines for e-government implementation and management. The lack of institution or unit that would have a coordinating function has failed to keep up with building up expertise and know-how related to e-government implementation and management. Public managers and IT managers strongly disagree on who's responsible for success of ICT projects. Public managers and IT managers strongly disagrees on who's in charge in leading ICT projects. Public managers in BiH state institutions have a wrong perception on "leading the project". They don't understand it as a process of initiating the project, leading the planning and execution, monitoring and closing phases; but instead thinks their role is in giving occasional approvals and overall support to the efforts of someone else - IT managers and personnel. Since it is about ICT, they thinks, experts in the field should be responsible for the project success. This belief comes from the understanding of ICT projects as "gaining the ICT value" and not "gaining the business value through the ICT-enabled change". Internationally speaking, in many unsuccessful e-Government projects, technology performed well but managers failed to recognize the importance of managing change in those projects (Bhatnagar, 2009). Another important obstacle to e-government development is the lack of legislative framework to support e-Government efforts at the level of individual state institution.

State institutions in major perceive e-government as a tool for internal government improvements, not service delivery. State institutions in BiH doesn't understand the potentials of ICT in providing citizen-centric e-Services. It is quite clear that while public employees itself doesn't grasp the true

potential of ICT utilization in public administration, and position themselves in the service sector, where "e-" enables them to provide their services in a customer convenient and friendly way, it is quite unrealistic to expect e-government initiatives that will exploit those potentials in full. The above findings show that BiH state institutions should first work hard on building human capacities for e-government. But even if such legislation exists and covers every aspect of ICT utilization; still the organizational capacities of BH state institutions to adopt and implement such legislation are very poor.

This study shows that in Bosnia and Herzegovina the development of local e-government, and e-government in general, is proceeding exceptionally slowly and faces a series of problems and obstacles. As a result, Bosnia and Herzegovina significantly lags behind other countries and current trends in this field. Also, the country lacks a strategic approach to the development of e-government, as well as coordination and clear competences of different levels of administration, while the legal framework is incomplete and uneven. The strategic documents have largely neglected the development of local e-government. In this context, given the limited resources, bureaucratization, lack of transparency and accountability, state, federal, cantonal and local level of authority have fallen behind in the area of e-government and e-participation, and citizens are not placed at the center when it comes to designing and delivering electronic services at the level of local administration.

Table 2: Country progress from e-government to open government (ReSPA, 2015)

	Transparency (OGP) & open data (EC)		Participation (OGP) & open decisions (EC)		Collaboration (OGP)& open services	
	Open data	Transparency & trust	Web 2.0 / social media	Feedback & participation	Service per-sonalisation	PPPs/PCPs
Albania	• Budget expenditure of treasury, by Ministry of Finance • Statistical data **4**	• Anti-corruption • Joined OGP+ 2nd Action Plan • Law on the right of information **3**	All ministry websites have social media **4**	New law on public consultation with provisions for feedback from stakeholders **3**	No **0**	• Action plans for OGP was adopted based on a PCP partnership model • Digital Police Station Application • ProTIK – ICT Recource Center **2**
Bosnia & Herze-govina	• Budget expenditure of treasury, by Ministry of Finance **3**	• Joined OGP • Anti-corruption • E-transparency **3**	Some use examples **1**	Some examples, but not systematically **1**	No **0**	• Vibrant NGO sector working with gov promoting e-services • 6 NGOs + govt. institutions formed partnership on OGD • Alliance for promoting transparent budgeting of govt. institutions • Development of Sarajevo Canton ICT Strategy **4**
Kosovo	• When data is published, it is only PDF **1**	• Law on access to public documents **1**	**0**	Some examples, but rare due to lack of trust **0**	No **0**	• Drafting of the OGP Action Plan which was done with the NGO "FOL" and the MEI • CSO platform "Civikos" is planning to help government with OGD and will use the PCP strategy **2**
Mace-donia	• 27 institutions, offering 154 open data sets (109 active and other in planning process) and their mash-up on OGD portal **4**	• Joined OGP+Action plan • Various laws • Anti-corruption **3**	Many institutions uses social media **2**	• Citizen diary • E-democracy • user satisfaction ('traffic lights') **4**	No **0**	• MoI – citizens schedule timing for submitting application and taking photo for ID cards, passports and driving licence • E-service (personality testing) when applying to administrative service **1**
Monte-negro	• Public procurement documents by the Public Procurement Administration of Montenegro • All documents and materials debated and adopted at the Governments' session **2**	• Joined OGP 2nd Action Plan drafting • Be Responsible campaign • Follow procurement • Open budget **3**	• Discussion fora • Others • Much use of social media • RSS & FAQs **4**	• E-participation (underused) • E-petition (underused, threshold very high) **4**	Some examples **2**	• PPPs are increasingly being used as a mechanism for covering the budget deficit • OGP Team drawn from business, NGOs & municipalities • Free wireless internet access project for citizens (joint venture PPP) and PCP ad hoc examples • 11 community projects financed with fines **4**
Serbia	• 25+ datasets on OpenData.rs • 'Register of medicines and medical devices' by Medical Devices Agency of Serbia • Data by Statistical Office • Open Data Readiness Assessment conducted **3**	• Joined OGP • Freedom of access to info by default • Anti-corruption • Public procurement law **3**	• Many uses Facebook, Twitter • Some have YouTube channels **3**	• E-participation • E-forum • Contact form on govt. websites mandatory • e-government portal has public hearings and discussion **4**	No **0**	• No examples **0**

Table 2. show progress made bay each country towards open government, where BiH still needs to do more efforts towards higher participation rate and collaboration especially regarding service personalization.

Table 3.: Summary country progress scores from e-government to open government (ReSPA, 2015)

	(1) e-government online services scores (UN, 2014)[84]	Open government scores (2015)[85]			
		(2) Total % score of max 24	(3) Transparency	(4) Participation	(5) Collaboration
Albania	42%	67%	7	7	2
BiH	28%	50%	6	2	4
Kosovo*	--	17%	2	0	2
Macedonia	25%	58%	7	6	1
Montenegro	48%	79%	5	8	6
Serbia	37%	54%	6	7	0
Mean score	**36%**	53%	**5**	**5**	**2**

As summarized in column (1) of Table 3., Montenegro is currently the clear e-government leader amongst Western Balkan ReSPA countries according to the UN E-Government Survey, 2014, a place it has only achieved since 2012, emerging from the position of the least well performing country in 2008. This is also shown by comparison with the data presented in the ReSPA e-government survey from 2013 (ReSPA, 2013). Both Albania and Serbia also perform well, and above the global mean with Albania often ahead in terms of specific e-government developments, whilst Serbia does better on the two e-government enablers of telecommunications infrastructure and human capital. Both BIH and Macedonia lag these three countries, and it is especially Macedonia that has fallen behind over the last few years compared to the UN e-government Surveys between 2008 and 2014 (see Table 4.) and the 2013 ReSPA report.

Table 4: E-Government Development Index (United Nations, 2016)

E-Government Development index (EDGI)					
Country	2008	2010	2012	2014	2016
Montenegro	0,4282	0,5101	0,6218	0,6346	0,6733
Serbia	0,4828	0,4585	0,6312	0,5472	0,7131
Albania	0,4670	0,4519	0,5161	0,5046	0,5331
Macedonia	0,4866	0,5261	0,5587	0,4720	0,5885
Bosnia and Herzegovin	0,4509	0,46,98	0,5328	0,4707	0,5118
Global mean	0,42679	0,41886	0,49078	0,47362	0,49220
Global top ten	0,79202	0,77818	0,86459	0,88887	0,84560

Table 4. shows that Montenegro was the leading country by 2014, although it started in bottom position in 2008, so it's overall e-government development has been very impressive, but in 2016 went on second place. Next comes Serbia which has been the regional leader but dropped back by 2014, and in 2016 went back on first place and then Macedonia followed by Albania and finally Bosnia and Herzegovina. All countries, apart from Montenegro, experienced reduced values between 2012 and 2014, but (as noted) this does not necessarily mean they reduced in absolute terms but that they reduced relative to the best performing countries globally, which can be seen by the values for the global top ten.

4. Conclusion

The paper critically investigates, evaluates, analyzed, compared and presented findings from the 25 e-government maturity models available in the literature. E-government maturity models play a key role in designing sustainable e-government services by assessing the context of e-government project implementation, and by providing appropriate strategic plans to execute the projects]. A well-designed and well-assessed plan would provide a better understanding of the strengths and limitations of governments, allowing the selection of the best possible approach to e-government project assimilation for its sustainability. We have concluded that the maturity models' stage names are different from one maturity model to another; their content may have some similarities and differences. The naming of the stages, particularly stage one and two, includes many buzzwords

with slightly different focus, even though the main foci were conceptually more or less the same. Although, we have noticed that the maturity models' stage numbers varies from 2 to 6 stages, while, the maturity models' year range between 2000 and 2012. In addition, the country that occupies the first position where the maturity models were developed and/or used is the US. Moreover, we can see that the most important stages of maturity can summarized into four distinct stages as the following: presence, interaction, transaction and integration, and we concluded that some maturity models are ignoring some important e-government features. This could be justified by the fact that many maturity models have been built without any input from the existing models.

Considering the abovementioned limitations, we concluded that e-government maturity models must address these limitations in order to support governments in the designing of sustainable e-government services. Also, we can argue since most of the maturity models have been built without any input from the existing maturity models, this can explain why they are not covering all the existing features available in the literature.

Regarding e-government, BiH is established as a complex state, composed of two entities and one district which was added as an independent administrative unit, later on. While we know that the success of e-government depends on the right combination of many different factors: innovative ICT, leadership and vision of public managers, re-organization and process reengineering, etc.; the introduction of IT in the BiH public administration was still treated merely as the computerization of government operations and not as a tool in an overall government reform. That lack of political awareness, vision and leadership contributed to the lack of a systemic, organized and methodological approach to the use of ICT in the public administration and it is not surprising that BiH was one of the last countries in the Balkan region regarding e-government development status. The lack of institution or unit that would have a coordinating function has failed to keep up with building up expertise and know-how related to e-government implementation and management.

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Preliminary communication / Prethodno saopštenje

THE WAYS OF PEACEFUL RESOLUTION OF DISPUTES IN DIGITAL SOCIETY

Abstract

The subject of the research is set two-dimensional, because, on the one hand, it deals with the concepts of peaceful resolution of disputes in labor relation in the territory of BiH in the 21st century aka "Digital age", while on the other hand it deals with patterns of behavior of workers. In doing so, the authors primarily focused on arbitration and mediation as possibilities of peaceful resolution of disputes, taking into account the private and public sector of Bosnian society, believing that they are not sufficiently known and thus not represented. This affects the behavior patterns of workers, creating a situation that is unsuitable for dealing with disputes or their delay, which reduces the effectiveness of workers and means of peaceful resolution of disputes. The aim of the research is to determine the degree of the employees awareness with the concepts of peaceful resolution of disputes with a specially designed survey conducted on a sample of 92 respondents from the public and private sector of BiH, which consisted 11 questions, multiple answers and was forwarded to the following addresses: business entities, state institutions and individuals. The study lasted five days. The authors believe that the research carried out implies a partial knowledge of the means of peaceful resolution of disputes and a lack of knowledge of the costs of the proceedings. However, the results indicate that there is a will to resolve possible misunderstandings and/or disputes in a peaceful manner, primarily driven by speed, reduced costs and the long-term of the solution created by peaceful means.

Key words:*arbitration, mediation, patterns of behavior, 21st century.*

1. Introduction

With the increasing development of technologies, artificial intelligence and other global novelties that are reshaping our relationships (social, business, familly, etc.), there is a relation and/or reflection with peaceful solutions, otherwise known as peaceful dispute settlement. Namely as teritorial and lingual limitations are being erased it should be taken into account that individuals that are trying to use and/or research informations about arbitration or mediation are not educated on this matter. Added to that, the internet platforms programmers often do not understand „legal terms and/or its scope". So it is a prerogative to expand the audience and include digital environment, socialists, psychologists and legal professionals to create together a modern and performing system for peaceful resolution that provides sustainable and dynamic system for every individual.

This article' research is not being conducted by a motiv to present or even to elaborate legal content of Mediation, Court Settlement and/or Arbitration. Individuals often refer to certain patterns of behaviour that do not recognize these means as a way to avoid overcrowded, costly and slow courts in Bosnia and Hercegovina (further in text: B&H). Furthermore it is written in order to motivate indivuduals, especially, in business environment, to investigate, research and implement either one of these models for resolving present or future disputes or conflict (to prevent disputs). So, this article's goal is to present that indivuduals in B&H, in order to make a binding and voluntary decision between peaceful means and traditional judicial insitutions, do not have the necessary

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quantity or quality of knowledge about benefits or procedures of either one of them. That just emphasizes the need to change these dimensions as well as to rise sense and awareness about peaceful means to modify effects of judicial system so it could be more simmilar to modern law systems. According to that this text will also provide essential informations about behaviour patterns and both models of resolution which will be presented so that the yielded results could be synthesized.

By doing so, they could create a positive enivornment such as: a) developing many sectros especially digital area which is hardly neglected and b) it will help rise security and stability for foreign investments that will create sustainablity continuity, and dynamic. Digital sector has yet to be developt in order to create digitilized legal procedure so it is a task to emphasize this deficiency. Idea is also to include psychology and sociology into these subjects because it is being recognized that their influence is being „overwritten" by the legal professionals.[3] To the authors of this research it is esssential to combine these academic professionals to create much needed legal security and the rule of democracy in Bosnia and Hercegovina.

2. Mediation and arbitration

Mediation is the negotiating process with the help of a third neutral side that makes it easier for opposing parties to find a solution in their own interest. Mediation is specific to the fact that a neutral third party appears as a mediator that helps conflicting parties to advance communication and find the best possible solution to their dispute.

Unlike arbitration, where the solution is arbitrary when solving a dispute at mediation, that is not the case. Mediation assumes that with the help of mediators finds a solution to the dispute, which will make it easier for both parties to find the best possible solution. The mediator takes into account the procedure and the mediation process itself, not the ultimate outcome or the content of the settlement and the agreement.

When conflict, mistrust, and dissatisfaction increase, people can find it difficult to get out of their positions and make some move to the solution. Sometimes they want to find a solution, but fear that their giving up and making the first step will notice the other side as weakness and retreat. When a conflict is accompanied by mourning, disappointment, grief, fear or pain it is very difficult to objectively assess the conflict itself and the role of the other side. It is even more difficult to reach a solution that will represent a common interest and be acceptable on both sides.In all these situations, the mediator helps emotions appear in a more functional way, to look at the position of the other side, and to open various possibilities for an agreement. He helps the parties to express their feelings and find a way to meet their own needs, while taking into account the needs and interests of the other side.

Unfortunately, mediation and arbitration are insufficiently represented in the resolution of disputes. One of the reasons is that the parties to the conflict are not sufficiently familiar with this way of resolving disputes and the other is that there is not enough of those who are instructed and trained to conduct arbitration and mediation. Apart from lawyers, mediation and arbitration can be carried out by psychologists, because mediation is a convenient way of solving virtually all types of conflicts. Except for solving international and court disputes, it can also be used to resolve conflicts within a family, school, and work organization.

3. Mediation in Bosnia and Hercegovina

According to the official website of the Association of Mediators in Bosnia and Herzegovina the process of introducing mediation started 1998 with the assistance of the founding partner Canadian Institute for Conflict Resolution. The legal basis for the introduction of mediation as a process of

[3]More on that hypothesis: Knežević, G., (2012.) Zbornik PFZ, 62, (1-2), 417-436, str. 419.

solving the dispute began with the change of the content of process norms with the participation of state institutions and local actors. They contributed to the reform of judicial practice and raising the quality of B&H citizens' knowledge about the possibilities and benefits of alternative resolution models. In relation with the Law on Litigation and Criminal Procedure in the Republic of Srpska and the Federation of B&H adopted in 2003, the Law enabled the possibility for judges to propose to the parties to resolve disputes by mediation.

Recognizing the advantage of mediation for the business environment, the South East Europe Development Program-SEED has been implemented which included: drafting a Law on mediation, conducting a mediation training program, developing a methodology of the implementation of the pilot project within the courts, forming a public information campaign about the benefits of mediation as well as providing technical assistance to create capacity building. These activities and those that followed at the state level resulted in a legal solution forbidding non-binding out-of-court mediation. Furthermore, the Initiatives made by the Association of Mediators in B&H resulted in the passing of the Law on Transfer of Mediation to Associations of the Mediator on 28.07.2005. That action empowered the Association itself to provide mediation services.

Since the article has been limited to the business environment of Bosnia and Herzegovina, the analysis of the mediation process will be set within the conducted and concluded mediation procedures in its territory.The legal content of mediation is very simple. Namely, it is a process in which a third educated person (mediator) assists the parties in their efforts to reach a mutually acceptable solution to the dispute.[4] The scope of mediators work is to establish and facilitate a dialog between the parties in order to achieve an acceptable, mutually positive and a long-term solution. Therefore, the mediator should not make decisions about the nature or content of the resolvement. In order to reach an agreement he/her has to “neutrally” listen with a special attention focusing on discussing the key issues, common attitudes, and parties' interests. But the questions that parties always ask usually are: "What is its purpose? To whom does it serve? Why should I mediate? How much does it cost? “as well as many other emerged questions afterwards. At this point it is important to note that this procedure involves a voluntary, confidential and neutral elements with no whatsoever advantage over the other party. From a technical and financial point of view, this process is: a) motivating: because the parties themselves make decisions with mutual respect and dialogue, b) efficiency: time line of proceedings, c) lower cost in relation to court proceedings and d) ultimate confidentiality. The benefit of mediation is of special importance because it builds positive patterns of behavior whether within business environment or just individuals. According to the research by the relevant institutions, the parties that have gone through the mediation process even though they agree on a solution to the dispute, are still motivated and more sensible to end their dispute as soon as possible.[5] During the process, each side of the dispute can elaborate its views/interests, clarify how the current dispute influences him/her, business, and what are the options that will fulfill their interests/needs. The mediator will listen carefully, direct the parties to talk about key issues to shorten time to meet the settlement, identify common views and stakeholder interests/needs, and assist the parties to reason their agreement upon them.

The mediation is not free, it often does result negatively so it is a dual obligation that the parties must fully be acquainted with the possible costs as well as the time frame in order to have a solid base for a long-term decision making. Pre-engagement to the procedure takes into account a possible risks of ignorance of relevant facts about the parties to the dispute. The late inititation of mediation can also mean the emergence of unnecessary costs. Thus, the time factor in mediation has a particular significance because it may affect the relationship between the parties in the dispute. It may result either as an improvement or as deformation of the existing relationships. For this reason,

[4]According: Zivilrechts-Mediations-Gesetz, (“BGBl I 2003/29”)
[5] Further reading: https://kb.osu.edu/bitstream/handle/1811/79731/OSJDR_V11N1_105.pdf?sequence=1. Access: 05/04/2019.

factors such as political support, regional development, security dynamics of relationships, financial constraints, digital informations, the education of the parties, and "selected" mediators, do contribute to the perception of the success or effectiveness of the process of peaceful settlement of the dispute.

With the international support and technical cooperation, the Association of Mediators in B&H has been developing an authentic mediation training program since 2004 that involved: educating future mediators, judges and lawyers, stakeholders and training for mediation trainers. This cooperation resulted in the first year of implementation with: pilot projects in basic courts, 590 mediation proceedings out of which 56% were solved positively (330 cases).[6] Today, this association has 174 mediators to whom citizens can turn to initiate mediation, such as an active or passive party or a party that the court referred to solving dispute by mediation. An active party, or one who wishes to initiate mediation proceedings, submits a request to the Association, either personally or via mail, alone or with the other party (this will reduce the cost of mediation). When a party submits a request, he/she pays a fee of 50,00KM plus VAT. The Association contacts the other party in the dispute due to its consent to mediation (mutual, voluntary). In the absence of a mutual consent, the mediation process cannot be initiated but the advance payment is lost. On the other hand, if both parties agree to initiate the process they pay the above mentioned amount on behalf of the administrative costs as well as the remuneration for the mediator's work (which can be selected immediately upon submission of the request) in the amount of 121.37 KM plus VAT. If the dispute is conducted by the court instances, by submitting the signed mediation contract it receives a Notification letter of the initiated Mediation.

When the mediation is completed by an agreement, the mediator will conclude a settlement agreement which is signed by the parties and the mediator, stamped and it is an executive document. Based on the mediator's report on mediation progress, the Association's service will issue a balance invoice to regulate unpaid amounts. Furthermore, if a court proceeding is conducted, the service of the Association will inform the court of the outcome of the mediation, while the parties are obliged to submit a copy of the settlement agreement to the judge, so that the Court could officially close the case as settled. The Passive Party, the one who submitted the request to try to resolve the dispute by mediation, if he/she so wishes to make a positive statement on the initiation of the procedure and to submit to the association that sent it. Furthermore, the passive party can immediately come into contact with the other party of the dispute and agree on the choice of the mediator. If the court has submitted a Letter of Mediation Proposal it is understood that disputed parties have received a Notification of the mediation Proposal. There is no particular difference except the one when the court is being informed about the Consent to initiate the mediation in the manner and within the deadline envisaged in the letter.[7]

4. The Arbitration in Bosnia and Hercegovina

As a country of political, territorial and legal complexity Bosnia and Hercegovina surprisingly does have largely harmonized civil law but it doesn't have a national arbitration act. There are several laws that govern national arbitration framework. Aside domestic acts B&H recognizes: New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards[8] as well as the European Convention on Human Rights.

According to Civil Procedure Codes B&H arbitration is a special procedure and places alongside other types of special procedures.Since the settlement of disputes between states and other international entities, is being based on the binding decisions made by an arbitrator chosen by the

[6] Available: https://www.umbih.ba/.
[7] Available at: https://www.umbih.ba/index.php/medijacija/pokretanje-postupka-medijacije. Accessed: 02/28/2019
[8] BiH will apply the Convention only to (a) awards made in the territory of another Contracting State, (b) differences arising out of commercial relationships and (c) those awards rendered after the Convention comes into force. In all other cases foregn arbitral awards will be recognized under Law on Private International Law

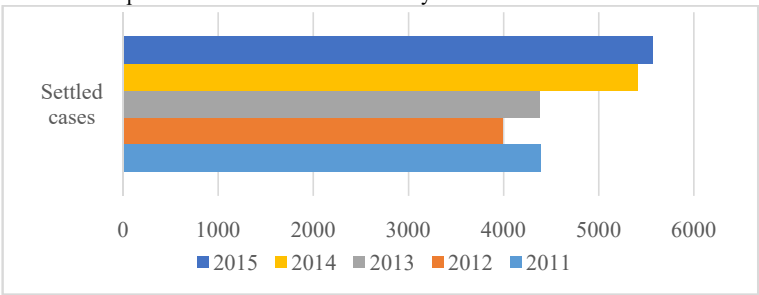
parties (mandatory and, as a rule, the final verdict), it is easy to conclude, when analy content of definitions of the scope and the nature of International arbitration, that it repr formally and legally binding form. When it comes to diplomatic dialogue, an arbitrary no arbitration arises, but it adjusts itself to the wills/interests/needs of a party in a dispute t alongside secrecy, is reflected in the mutual selection of the arbitral body. In this way, bon consciously and willingly expressed and it confirms the objectivity, trust worthy and impart the chosen Arbitrator. The Consent to arbitration may be given to an already existing di future dispute (stipulated in contracts) that may arise between the parties to the (inst arbitration). So, when considering the expected results of the process, there is no essen difference between the International Arbitration or „Domestic Arbitration", because it is exp resolve a dispute or misunderstanding between parties and reestablish good relationship.[9]

It is possible to foresee a different approach to more successive settlement, such as: f negotiate, then conciliate, and initiate arbitration as an ultimate mean to a sustainable settlement. The Consent to an Arbitration can also be given in the form of so-called Ar Clauses on any subject. When a dispute is already present the Consent to Arbitration is e by Arbitration Compromise. A compromise may require the Proposal of Future legal nc regulation of the relations between the disputed parties. These are equal to the decision base rule known as ex aequo et bono. In practice, however, it is commonly believed that there i consent to arbitration even though the compromise has ceased to exist because the partie and arbitrarily participate in the arbitration proceedings.

5. Peaceful Settlement of Disputes in Bosnia and Hercegovina

Bosnia and Herzegovina complexity is certainly a problem for an adequate systematic arra that contributes to peace, stability and the ultimate development. As such, it faces many p which solutions are very often tripartite and associated with achieving sustainable developn the efficiency of justice. In the absence of resources, the state and its officials are addressi counterparts for assistance and support. Considering the standards that must be achieved, having in mind that much has not been done for the establishment and upgrading of the system, The Council of the High and the Judicial Prosecution has implemented a Project to gap. The aim of the project is to improve the efficiency of the judiciary by applying peacefu to solve disputes as well to prevent new cases in front of the courts. This project was supp the governments of Norway and Sweden who made available their experience and kn during the period from 2016 to 2019 and financial support of 1.6 million euros.[10]
When referring to BiH courts that are deployed by Federation, Republika Srpska and Brcko with the total number of municipal courts: a) in the Federation of Bosnia and Herzegovina the Republic of Srpska they have been appointed as basic courts, totaling 19 and finally District Brcko just 1.

Graph 1. Review of cases resolved by Court settlement in BiH[11]



The courts in B&H have implemented the project Improvement of the efficiency of the judicial system to make progres sin making more efficient dispute reslution process as well as to make a transparent archive material. So, anylizing these public datas this Graph 1 presents that in year 2011, the courts of B&H have solved 4.384 cases, ine year 2012 they solved 3.993 cases, 4.344 in 2013, 5.413 cases in 2014 and 5.568 in year 2015.

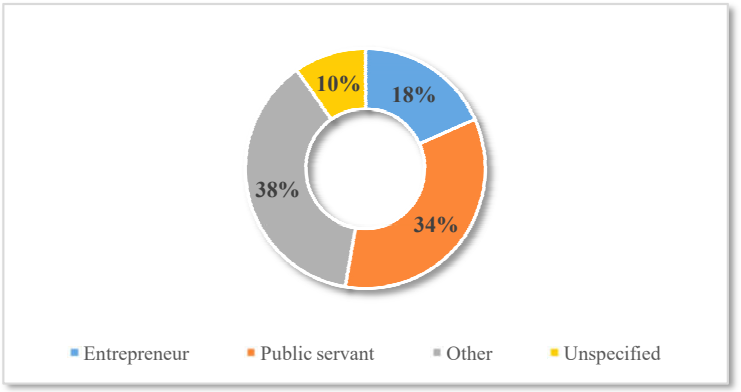
Available data confirm that the courts in B&H are burdened. Namely, according to the data of The Council of the High and Judicial Prosecution, court in Banja Luka in 2013 predominate with 41,398 unresolved cases, while the courts in the city of Mostar have 25,810 unresolved cases. Judicial system should not allow no further neglect in any dimensions. Since the aim is to apply mutual reconciliation as a tool for reducing the number of cases and the lower burden on judges it seems that court settlement, the social contribution of this article' topic and aim becomes very clear.
Comparing the previous conditions and conditions after the project implementation of the peaceful settlement of the disputes, the efficiency is visible both internally (within institutions) and externally (among citizens). Namely, in Mostar, the number of unresolved cases is lower for 4093 resolved cases at the municipal level without additional burden. Therefore, if the goal is to expand the knowledge of the local community about the procedure and benefits of peaceful settlement of disputes, there is a reasonable expectation of continuing the trend of reducing the number of unresolved cases. If digital access is facilitated, it will increase in: a) transparency b) trust, c) the number of users and d) reducing the cost of resource disputes. With all that said the authors conducted research motivated to find out which information citizens of B&H actually know? So they asked the simplliest questions.

6. Bosnia and Hercegovina's and Means of the Peaceful Dispute Settlement

Taking into consideration the theoretical knowledge of behaviour patterns and peaceful dispute settlement and the synthesis of the yilede data from the practice it was naturally motivated to questioning citizenship in the territory of B&H about this matter. The survey consisted of 11 questions with offered multiple responses and was forwarded to the addresses: business entities, state institutions and individuals that work in both. The average online survey duration was 2 minutes and 36 seconds, while some surveys were filled out by individuals. The total number of respondents is 92, and they are sent to more than 134 relevant addresses, which means that the activity was 68.65%, The requirements for critical mass is met so the authors were able to make a qualitative conclusion.

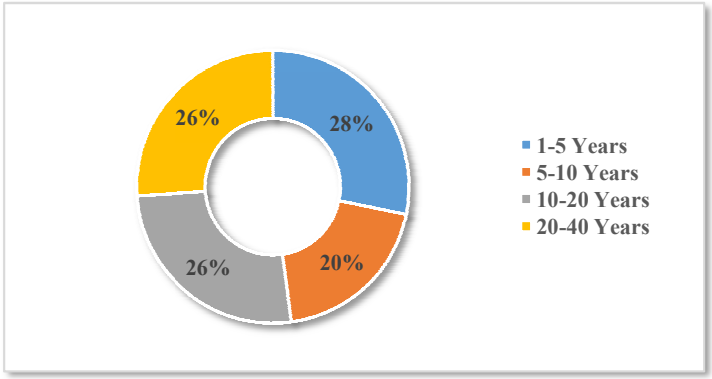
[11] More details on official web site The Council of the High and the Judicial Prosecution: https://vstv.pravosudje.ba/. Access: 03/28/2019

Graph 2: Participant's working status



The Graph 2 shows Educations qualification of the participants, indicating the quality of the obtained results. The largest number out of 92 participants in total, 38% of them have chosen the status of Other. It implies that the participant is either unemployed or she/he does not want to show status. Interestingly, the second largest number of the participants, 34% "enjoyed" the status of a civil servant. Since the state is a major actor and a factor in encouraging peaceful dispute settlement, among citizens or between citizens and the State, taking actions as an active contribution to rise them, shows that it is necessary to educate them as individuals so they can efficiantly complete tasks as state representatives or even as citizens. That this area is relevant and recognized as such states the fact that the number of expert advocacy agencies for consulting in peacfully settling disputes are rising in the territory of B&H, especially in the Enthity of the Republic of Srpska (RS). Namely, in the RS after the establishment of The Agency for Peaceful Settlement of Labour Disputes, 20 years ago, it has resolved with Arbitrator or Mediator more than 1,300 disputes (individual or collectively) for peaceful settlement of labor disputes out of which 85% was solved by agreement.[12] Why is this information important? Well, the fact is that more than 70% disputes are filed within the public sector.

Graph 3: Participant's working length

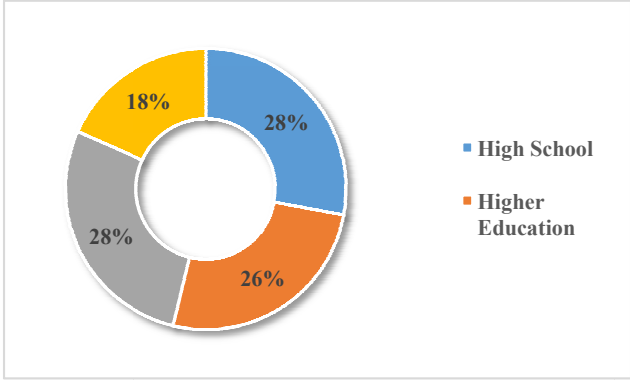


In order to confirm the maturity and seriousness of the responds, instead of the age, the survey included length of work experience in a particular profession. This was done to achieve the gravity of implications of the responses. So, the yielded results were that 26% of them are people with at least 10 and a maximum of 40+ years of working experience. With reliable confidence it is possible to conclude that the answers were honest and based on the gained working experience in various social structures. Bosnia and Herzegovina has been struggling for decades to reduce unemployment,

[12]More details available: http://radnispor.net/. Accessed: 3/2/2019

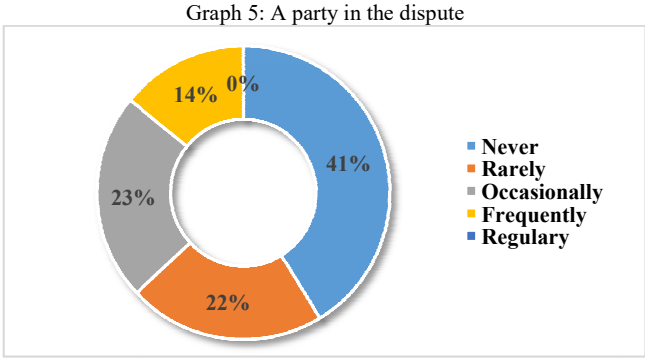
as well as the employment in the public sector, so it is to expect many disputes when the true reforms are performed. These individuals must be prepared for peaceful settlement.

Graph 4: The level of education of the participants



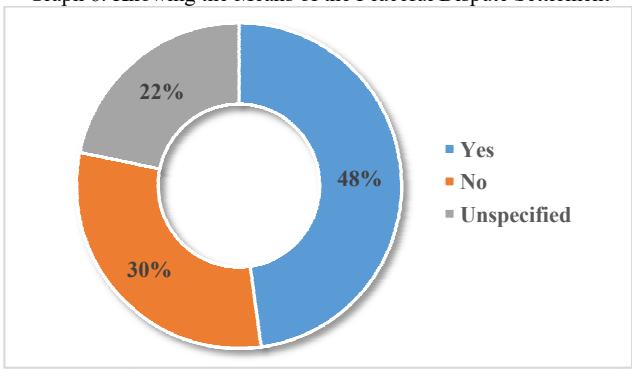
In order to confirm the above mentioned premise the professional qualification has been included. Among participants 28% of them are either high or higher educated, while less educated 18%, falls under Other, 4 out of total 92 participants were either full time professor or PhD graduates.

Graph 5: A party in the dispute



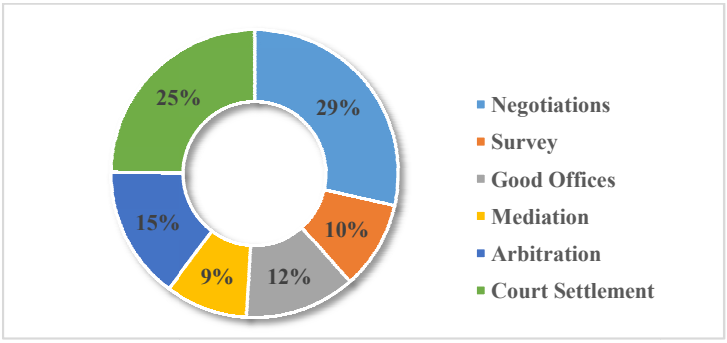
Surprisingly, the yielded results were that out of the total 100% (92) participants only 42% (38) were involved in a dispute, 41% (37) of the participants were never in a dispute, while the rest were dispersed. This data is relevant because it refers to the level of voluntary reconciliation which may be an indicator of possible increases in the overall emerged disputes, unresolved disputes-incompatibility of parties' interests, needs and will.

Graph 6: Knowing the Means of the Peaceful Dispute Settlement



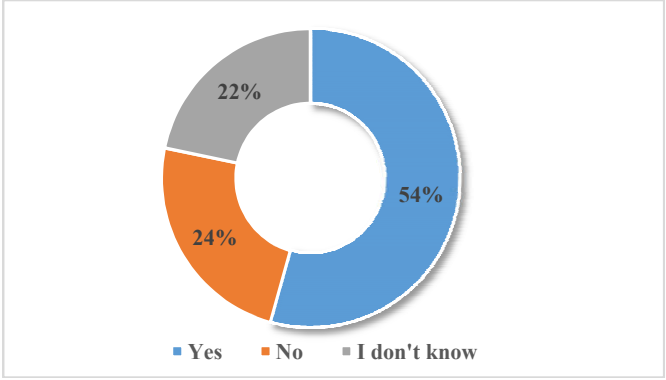
Diametrally to the previous question the participants of this survey, most of which were never in a dispute, 48% positively confirm and evaluate the knowledge about peaceful means of dispute settlement. Namely, before interviewing, participants were informed that it is irrelevant whether there is a dispute between citizens, states between states, states against an enterprise or states against citizens. Thus, the ultimate goal was to determine the degree of the knowledge about these peaceful means, especially about: their diversities, content, to whome and what do they apply to, the duration, the price, etc.

Graph 7: The adventages of the Peaceful Means for Dispute Settlement- free choice



Using the data from the previous graph, and expecting the participants to know the difference between legal and other means, the result, as far as participants alleged knowledge applies, is that negotiations are the most common mean of accessing a peaceful way of solving or harmonizing contradictory interests and opinions. However, with 25%, the court settlement follows the negotiations, which can have its roots in the percentage of 34% of civil servants. Namely, judicial settlement has often been "promoted" in recent years not only as efficiently but as a modern mean. The smallest percentage of participants went to Mediation as a mean of resolving disputes. This is interesting because in B&H, according to the list of the Association of Mediators of B&H[13], there are 163 mediators of various professions with the stated goal of resolving disputes quickly, efficiently, and to satisfy all parties in the dispute. That contigent helps the courts to reduce the number of unresolved cases and the trend of the long-term inflow of new cases into courts.

Graph 8: Legal Means of peaceful Dispute Settlement in reducing costs

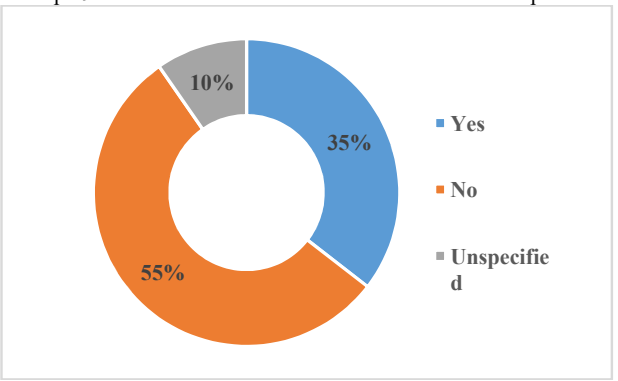


Assuming that the majority of participants know at least one MPDS, a question has been raised about the costs as one of the essential advantage of the legal means. Since this is the most common and promoted advantage then one should not be surprised either by the fact that participants "think" that they know that these means reduce costs. Namely, if we return to the results of the majority

[13] Available: http://www.umbih.ba/index.php?option=com_content&view=article&id=106&Itemid=222&lang=ba. Accessed: 04/11/2017

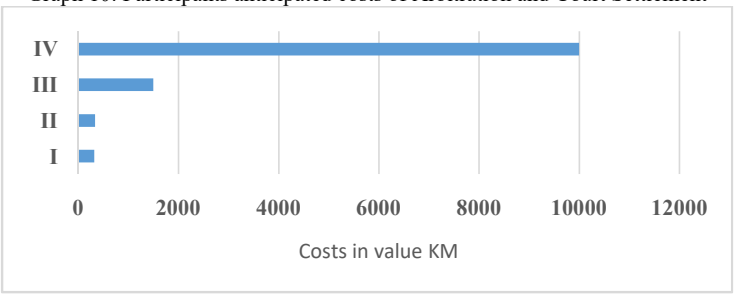
who have never been in a dispute, all this raises question if they really knew what is negotiation, court settlement or arbitration. The question is what decisions do precede to what means, which decisions are final and binding, is deliberately avoided, because of the wide range of social structure of participants. This is based on the fact that the content of this aritcle is not aimed at the legally educated but, on the contrary, on those who most often or will have the opportunity to settle possible misunderstandings and//or disputes peacufully.

Graph 9: Arbitration and/or Court Settlement Fee and Expences



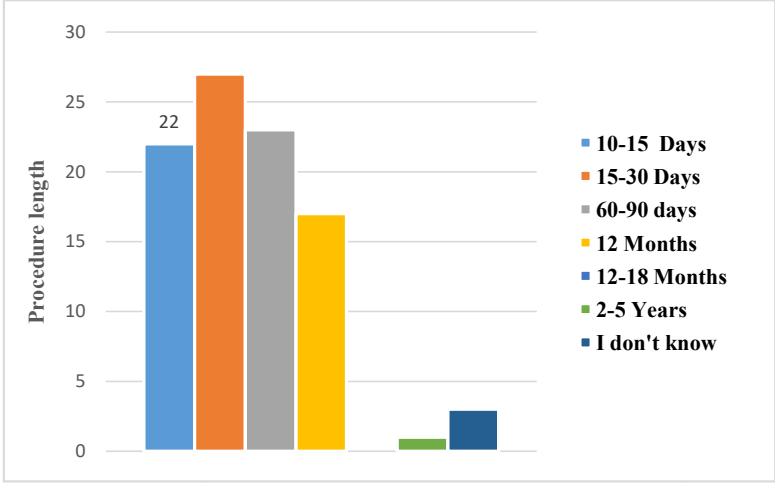
The justification of the previous presumption was confirmed by the yielded results with the Question about the amount of Costs and Fees of Court Settlement or Arbitration. The percentage of 55% admitted that they did not know the amount of fees and / or costs of the proceedings mentioned before. Therefore, it should not be a surprising fact that courts throughout B&H organize Open doors on the topic "Judicial Settlement Week", whereby all judges should propose cases that can be resolved peacefully and that all interested persons are introduced to their rightful access to information personally or via submitting an online application.

Graph 10: Participants anticipated costs of Arbitration and Court Settlement



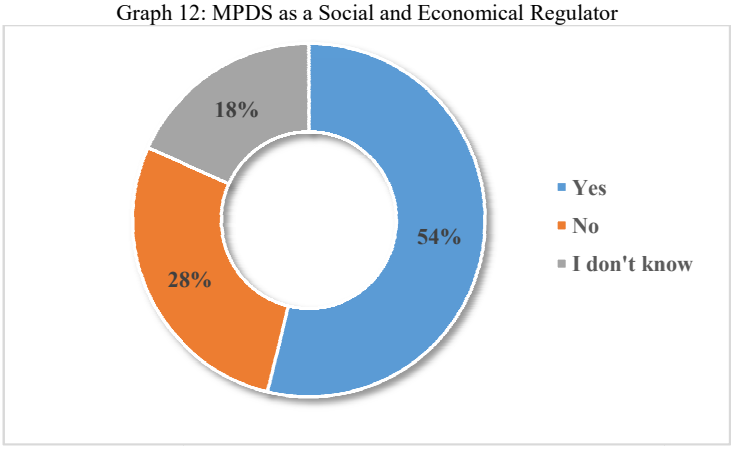
When asked how much money a party can allocate during a procedure, participants set a broad response parameter. Namely the answers went from minimum of 320.00KM to 10.000,00KM. So they are implicating that participants do not have a clear cost perspective and assume (or worse they weren't sincere when answering) that the important factor of estimating the future costs is the the value of the disputeitself.

Graph 11: Presuming the Length of procedure of the Settlement



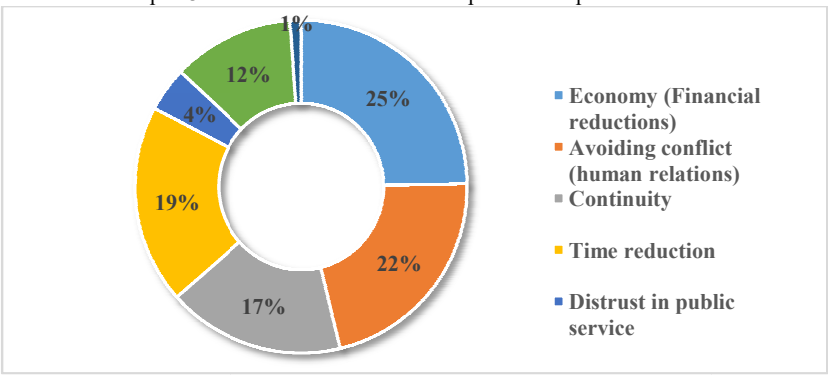
When asked about the time spent on the peaceful dispute Settlement, regardless of the apllied type of the mean of alternative solutions, the participants gave the highest percentage of 15 to 30 days, with 33% and at least between 2 and 5 years. It was expected that only a few participants chose the answer „I do not know“, although with its 4%, in relation to the answer from 12 to 18 months that nobody has chosen. Considering this time, from 12 to 18 months as most realistic time to sucessfully settle dispute or misunderstanding in the Western to whome B&H is tying to ascend.

Graph 12: MPDS as a Social and Economical Regulator



In paralel with the previous results, and with the awareness of the promotion that has been actively pursued in the last two years in B&H 54% of these participants confirm that peaceful means have the future as an instrument of regulation of socio-economic relations. However, one should not neglect the percentage of 18% of participants who do not know whether these means have a place and a role in practice. It should be considered as a contigent that needs to be educated and informed in order not to become a negative trend or a beahviour pattern which can and will, if they are not dealed with, significantly influence the creation of good practice in BiH.

Graph 13: Three reasons as Motive for peaceful dispute settlement



In order to examine the opinion and find a possible motive for a peaceful settlement and resolution of disputes, a question was asked which was left to the free choice to answer. Out of 93 respondents, only 12 did not suggest any motive. The rest of the suggestions were differently described but the authors were able to classify them into certain categories: time, mistrust, quality, economy, durability and belief. These were tho choices made on the presumption that peaceful dispute settlement is a tool for strengthening faith in the judiciary in B&H and bona fide in the general.

Ultimately the Survey implies partial knowledge of the means for peaceful setllement of disputes or misunderstandings and a great lack of knowledge on the costs and time of the proceedings. However, the results suggest that there is a willingness firstly to settle possible misunderstandings and / or disputes, motivated by speed, reduced costs, and ultimately the sustainability of a solution.

7. Conclusion

This Article and yielded results of the survey are implying that there are certain behavior pattern in direct selecting courts (state) institutions. Namely, when lacking knowledge and information most people tend to choose the most known options to settle a dispute or conflict. These options often include courts, even for those cases that are financially and timely exhausting.
The results point to the need to digitize access to the informations and the process, and this digitized education must include lawyers, involved parties, but also software programmers, psychologists and other interested indivduals. There is also a vivid need that digitized access is equal, because there is a confirmation of the premise that these peaceful means are not sufficiently known and therefore not represented in the practice. This affects the behavior patterns of workers, creating a situation that is unsuitable for dealing with disputes or their delay, they do not know about the procedure or benefits, which reduces the effectiveness of workers, business arena and its competitiveness, as well as it is negative for the means of peaceful settlement.

So, authors strongly believe that this research main goal set from the beginig, to determine the degree of the awareness about the concepts of peaceful settlement of disputes/conflicts, is met. However the negativity of it the results also indicate that there is a will to resolve possible misunderstandings and/or disputes in a peaceful manner. These are primarily driven by speed, reduced costs and the long-term of the solution and with its digitalization these benefits can only be more presented, used in a positive way, meet the needs in the 21st century and create a sustainable, positive, and dynamic social-economic system.

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Review paper / Pregledni rad

CONTEMPORARY JOURNALISTIC KNOWLEDGE AND SKILLS AND INTERNET PORTALS

Abstract

The development of information and communication technologies, especially in the last few decades, had an impact on almost all areas of man's work and activity and created the need for new knowledge and skills. This is also reflected in journalism, especially in changes and adjustment of journalistic forms and the relationship towards the public. Today, users of media content largely use new technologies, participate in analyzing, creating, publishing and critically evaluating media content, i.e. they are becoming increasingly active and demanding. Because of all this, journalist has a task to adapt to the new audience by acquiring new knowledge and skills.Internet portals, like no media before them, combine the need to know and master new technical and content knowledge and skills that give the journalist profession a whole new dimension. Therefore, this paper will, based on the example of experiences of journalists on portals in Zadar, explore what knowledge and skills are required for work in the new information and communication environment of contemporary journalism and the new audience. Special attention will be paid to technical knowledge and skills, knowledge of various information systems for processing of journalistic texts, photography and multimedia, the use of new tools, and content knowledge and skills such as editorial skills, headlines and word processing skills, putting journalistic content on social networks and hybridization of journalistic forms.

Keywords: *IT technology, modern journalism, portals, knowledge and skills, Zadar.*

1. Introduction

Emergence and development, as well as the application of the Internet has brought great changes. These changes are evident in nearly every area of human work and activity, from the earliest stages of life. Internet and modern information and communication technologies also had great influence on the field of media and journalism. As an example, we can mention that today traditional media mostly also have their Internet portals and are also active on social networks. Regarding the Internet portals in Croatia, based on the page views tracking Gemius, three most popular portals in March 2019 are, in the following order: 24sata, vecernji.hr and dnevnik.hr (Gemius AUDIENCE, 2019). In the context of observing the media in the digital age it is necessary to mention the concept of media convergence. According to Zgrabljić Rotar (2011:43), the concept of media convergence is often used in the scientific, as well as media environment, and it is very important for the understanding of new media. She also considers that convergence is, “the key concept for understanding new media, as well as the concepts of interactivity or information society.” (Zgrabljić Rotar, 2011:43) Media convergence can also be explained as, “the process based on digital technology which abates traditional borders between media.” (HRT, 2019) In the news desk the concept of convergence refers to, “...principally the process of news production in which the same contents appear, elaborated in different media, i.e. written, television and online form, and not just in the newspapers, on television and computer, but also specially edited on mobile devices, and even on illuminated advertisements on buildings." (Quin, 2004, according to Krajina, Perišin, 2009:943)

Analysing the work in an integrated news desk, Brautović emphasizes that journalists have to have new knowledge. (Brautović, 2011: 143) He also underlined that, "They must not be specialized for a specific media but have to know how to prepare materials for different media. They have to be capable to interview, collect audio features, video features and photography features, edit photographs, participate in the creation of interactive elements (graphics and online databases) and write texts for distribution through different media platforms." (Brautović, 2011: 143). In the scientific and media context the hybridization of journalistic genres is ever frequently mentioned. In genre theory, the hybrid genre can be explained as "a combination of two or more genres." (Oxford Reference, 2019) Kostadinović (2017:153) states that former division of genres in journalism has changed and that today "it is much more accurate to speak of genres hybridization." Regarding the Internet media Gruhonjić (2016:101) states their basic characteristics, "hypertextuality, multimediality and interactivity." In the same paper *Hybridization of journalistic genres and the future of radio*,regarding the hybridity of journalistic genres, he stated their basic characteristics, "combination of traditional journalistic genres, hypertextuality, linking, multimediality, photographs, audio features, video features, charts and other kinds of illustrations, specifically graphical design, determining keywords by which the search can be performed, good and striking headlines, subheadings in the function of lead, interactivity, social networks, forums, blogs, chat programmes." (Gruhonjić, 2016:102). The emergence of social networks has brought about changes in the media world, and thus in the field of journalism. "Coexistence", the connection between social networks and journalism is becoming increasingly intense. Social networks, among other things, are used for information, communication, product placement, a faster way to a potential audience, etc. For all these reasons, they have become an important tool in everyday journalism.

A new dimension of journalism also influenced media users. Stančić stated in the tabulation of the *Relation of "older" and "new" users of media contents* that new users are: "active, unpredictable, global, dynamic – they use several media, they can easily stop using one and start using another, unloyal – they have a wide choice and they choose what they like, demanding – they expect a lot of quality contents, publicly critical – the media gives them a global audience, but also a big possibility to check the received information, socially networked, noisy and media exposed, disobedient, they want free service, organized, they can easily organize and engage by using social networks on questions they find important, impatient – they want information immediately and at the moment in which it occurs, mobile – they receive information at their current location, understand and use technology better, users and creators of contents." (Stančić, 2011:65). Media users are increasingly participating in the public media space, which has given rise to the so-called citizen journalism**.** Authors, in their article *Journalism between public service and attracting the public taste* conclude that citizen journalism in multimedia editions cannot replace professional journalists. Their social role has changed in the public sphere, but it has not disappeared because of the application of new technologies (Stamenković, S., Milenković, V., 2014:645). In the environment of changes in the field of media and new user's requests, it is certain that journalism in the digital age inevitably also requires new knowledge and skills also with journalists. Regarding the higher education in the field of journalism in Croatia, it is performed on several higher education establishments. Tijana Vukić brought a list of study programmes in Croatia in the academic year 2017/2018 for the education of journalists. (Vukić, 2017:255) At the Faculty of Political Science in Zagreb, the undergraduate and graduate study of Journalism is performed. At the Croatian Studies of the University of Zagreb the undergraduate and graduate study of Communicology is performed, at the University of Dubrovnik, Department for Communicology the undergraduate study of Media and Society Culture and the graduate study of Media is performed. At the University North, Department for Journalism in Koprivnica the undergraduate and graduate study of Journalism is performed. At the University of Zadar, Department for Tourism and

Communication Sciences the graduate study of Journalism and Public Relations is performed. At the Croatian Catholic University of Zagreb, the undergraduate study of Communicology is performed. At the VERN University of Zagreb, the undergraduate study of Journalism is performed. (Vukić, 2017:255) Tijana Vukić, who has principally dealt with research of journalist's skills in the book "From Journalists to Journalism: Journalistic Skills from a Perspective of a Journalist", has, among other things, emphasized in the conclusion, that by analysing the contents of pedagogical documents of the study for education of journalists it has been established that, "although it is not directed towards a complete and adjusted acquiring of journalistic skills (and related concepts), it is oriented towards sustainable (civil and democratic) social values and principles." (Vukić, 2017:292) Regarding the knowledge and skills of journalists in a modern society, the knowledge of foreign languages has an important role. In the paper titled "The Role of English in the 21 Century Journalists'Education" among other things, the importance of English language in the education of journalists is emphasized. It also emphasizes that to the media, regarding their global role, "...the necessity of active use of English language is imposed, for the purpose of competitiveness of the profession and its excellence, which are measured worldwide." (Batoš, Matić-Ivušić, Zakarija, 2010:108) The authors also underline that every journalist should have good knowledge of at least one foreign language. (Batoš, Matić-Ivušić, Zakarija, 2010: 125)

2. Methodology

The paper uses the methodology of a structured interview. The questions were sent to all news and media websites. The criteria for subject selection are female and male journalists, employed on informative Internet portals in Zadar. The questions were sent to all news internet portals. Eight female and male journalists from five portals in Zadar answered the questions and participated in the research: 057info, Zadarski.hr, Zd1, Narodni list portal, HRT Radio Zadar portal. Objective of the paper is to receive a deeper insight on the basis of a structured interview with female and male journalists from informative Internet portals in Zadar into the experiences on the influence of new information and communication technologies on their need to adopt new knowledge and skills while performing journalist work; on the importance of formal education in their journalist work, on the influence of higher education in the field of journalism on the quality of performing journalistic work, on attending courses, seminars or other forms of improving journalistic knowledge and skills, on the need of mentioned forms of professional training, on expansion of work in journalism today, on requests for specific knowledges, importance of knowledge of foreign languages, on journalism and social networks, on the use and reasons of use of additional possibilities of social networks.

3. Research results

The research part of the paper refers to the structured interview which was conducted within the time span from 15 March to 1 April 2019 with eight journalists from Zadar, from five different portals in Zadar: two journalists from the portal Zadarski.hr, two journalists from the portal narodni-list.hr, two journalists from the radio portal HRT- Radio Zadar, one journalist from the portal 057info and one journalist from the portalZD1. Ten questions were prepared, and they were sentto the subjects in the same order.

A question was asked to the subjects *Has the development of new information and communication technologies influenced your need to acquire new knowledge and skills in performing journalistic work? If yes, what are they?* On the influence of new information and communication technologies on the need of the subjects to acquire new knowledge and skills in performing their journalistic work, all answers were affirmative, i.e. they all agreed that in this kind of work it is necessary to keep track of information and communication technologies which requested from them additional engagement and keeping track with trends in development of new technologies intended to professional journalists. Three subjects have especially emphasized the Internet in their answer,

underlining that *the media have radically changed with the emergence of the Internet*. One of the journalists has pointed out that today in the journalistic work a lot of information is gathered from portals and social networks. Social networks today help journalists to, for instance *...in a very short time find out from the spokesman of a certain institution when will some important political figure visit a certain institution or city because through a social network the spokesman and all journalists keep a permanent contact*. Before the existence of the Internet, this example of communication was conducted over the phone or by telefax. One of the subjects vividly described his difficulties during the performance of his everyday journalistic work before the emergence of the Internet: *...I lost most of my time on, yes, yes, more than on waiting for answers from different PR services and spokesmen, it's hard to imagine, right, on finding telephone booths, or just a regular phone if I'm on the field, to public an ordinary news...* One of the journalists from a radio portal pointed out that new technologies accelerated the process of publication of informative contents and that due to the media convergence it was necessary to gain new knowledge, i.e. in his case, when we are talking about a radio portal, *use the programme for editing photographs and videos, for drafting of iconographies, statistical tools, programmes for publishing on the internet portal and use of social networks*. One journalist from a video portal also mentioned media convergence as a consequence of the development of new digital technologies, emphasizing that all the media today are completely adapted also to social networks. To the question *Does the importance of formal education in your journalistic work play any role, and to which extent?* most of the subjects think that it does not play a big role, or it does just partially. Most of them state that during their formal education they acquired general knowledge, but that they had to acquire the professional, occupational part of journalistic work through their work, whether exploring new knowledge and skills themselves or observing older and more experienced colleagues during their work.

The next asked question was *Do you consider that higher education in the field of journalism has an influence on the quality of performing journalistic work?*Regarding the influence of high education in the field of journalism on the quality of performing journalistic work, four subjects responded that they find that a certain influence exists, but that it is not crucial. They have stated different examples in their answers: how the study of journalism helps as an upgrade; or that after completed education, when a journalist commences with his work, he sees that he has no talent for writing; as well as that higher education in Croatia is mostly based on theory, and in much smaller extent on practice, which is in no way good for the beginning of performing of journalistic profession. Two subjects stated that they personally know several of their colleagues - journalists who are doing their job excellent, and they are not educated journalists: *In news desks I encountered, by chance or not, almost regularly, more quality, at least for me, works of female or male journalists – without higher journalist education*. One of the subjects responded that his higher education was not in journalism, and he considered that from the practice point of view, higher education of journalists does not have a crucial role.

To the fourth question *Have you attended courses, seminars or other forms of improving journalistic knowledge and skills until now? If yes, which ones?* most of the subjects responded that they attended some forms of courses or seminars for the training of their journalistic knowledge and skills. Two subjects stated that they participated in a workshop which lasted for several weeks – Journalistic school in the 90-ies of the last century, organized by the Croatian Journalists' Association: *Those seven weekends has influenced my practising journalism in a great manner, because we were taught there how to narrow the view on the most important issues, and not to be misled astray.* One of the subjects stated reporting from the Hague tribunal as one of the forms of practice which perfected his journalistic work. They also stated seminars which they attended abroad – America, Germany and Croatia – Zagreb, Vukovar, Opatija. Two subjects from radio journalism also stated that they attended specialized seminars for their journalistic work: use of Microsoft Office package, a course on online journalism and on data journalism. One subject stated that he had personalized training, and two subjects stated that they have not attended any courses or seminars for training, but that they would wish to in the future.

To the question *Do you consider these forms of professional training needed in your work?* almost all subjects gave an affirmative answer that courses, seminars, workshops and other forms of journalistic training are needed and desirable in their work: *Training has helped me on my development path and is by all means welcomed for everyone who practices journalism.* Some of them point out that it would certainly be good that all these forms of training are concrete and actual and that experts from practice participate on them, rather than theoretical ones, and they also notice that today they are fewer every day.

To the question *Have your work assignments widened today, and to which extent?For instance, other than writing texts, do you now edit, finish, choose photographs...?* All subjects have stated that their work assignments have widened, so we can no longer say that they exclusively write the text: *Absolutely, from writing texts now we are talking about video editing, taking photographs, editing, moderating, filming... ...I solely finish and choose photographs, I also take photographs when needed, I make short videos which I share on social networks, I participate in the creation of the Facebook page*. They also state some new forms of their work: knowledge of maintaining portals and social networks, the skill of choosing, finishing, editing and uploading photographs to portals, editing of features and radio shows for the radio programme and editing of recorded audio materials with the help of audio processing programmes (the last two examples refer to radio journalism).

The following question was *Which specific knowledge of handling special systems and programmes for work on the portal and, for instance, with photographs, were requested from you in your previous work?* From specific knowledge needed for handling special systems and programmes for work on the portal or with photographs, two of the subjects stated CMS system for editing internet portals. CMS is the abbreviation for “Content Management System”, a system for editing the contents of pages where it is possible to add, remove or edit contents.

CMS provides the abilities for multiple users with different authorization levels to manage the contents, data or information of the webpage or internet application. Content management refers to creation, editing, archiving, publishing, reporting, distribution of web contents, data and information. Subjects also mention programmes for photography editing like Irfan View and Photoshop, or special programmes for placing journalistic text, created for the work in their media house. They also stated YouTube as a social network which will be necessary for work to all journalists in the future: *Together with the work on the portal, today's world of journalism requires the knowledge of work on the social network Facebook, and slowly other social networks will become relevant, especially YouTube, because the world is increasingly turning towards the video, last year in the marketing world was even declared the year of the video, therefore I believe that it will become a necessity that journalists, together with the work on that social network, also start making videos.*

Also, the question was asked *Do you consider that it is important for your work to speak foreign languages, and which?* All subjects agreed that it is necessary to have knowledge of foreign languages in journalistic work. They gave priority to English, which is according to all subjects definitely the most important language for working in the journalistic profession, and then stated that it is certainly desirable to know and use another foreign language: *Yes, there were numerous situations in which it was necessary to know a foreign language. It is necessary and implied.*

Subjects were also asked the following question *Is it possible to practice journalism today without presence on social networks? Please, substantiate your answer.* Eight subjects responded that it is not possible. Some of them stated that social networks are the fastest way to publish information, but also to receive information: *In the current time of new media, it is just that part of journalistic work, i.e. the speed of publication, which has an ever-greater accent, in a good or bad sense.* They point out that media users today, especially young users, get information exclusively from social networks. One of the subjects stated that information which users get through social networks are often an unreliable source of information and that every journalist has the task to verify the

information and process them journalistically. Some of the subjects stated that it is necessary to use social networks in journalism because through discussions on social networks public opinion is formed. One of the subjects stated that the media today have become addicted to social networks and that they expect that everything is available in one place, and social networks are enabling just that. They also state personal social networks as a good source of interesting information for users: *Also, good stories lie in "ordinary people". Someone will share his grandmother, who is climbing on olives and goes trekking at the age of 89. All friends will love it, and you as the journalist will have a good story. I think that by avoiding social networks a lot is lost*.

The last question was *Are you using additional possibilities of social networks like live broadcasting or some other tools, and why?* Only two radio journalists stated that they use live broadcasting in their work, with one of them stating that it is the fastest way of publishing information and that that kind of informing is very well accepted by the users. One of the subjects mentioned Instagram, which helps him in his journalistic work to get exclusive news if he accidentally finds himself as a journalist on site of an event. Other subjects responded that they do not use additional possibilities of social networks.

4. Conclusion

The development of Information and Communications Technologies has brought about significant changes in almost all areas of people's life. They are particularly reflected in the field of journalism, among other areas, on the creation of new media, media digitalization, media convergence, and hybridization of newspaper genres. In the context of the above mentioned changes, users are also changing, and journalists have the task to adapt to the new situation which requires new knowledge and skills.

Subjects of this research emphasized the necessity of keeping track with new trends in the field of information and communication technologies by adopting new knowledge and skills needed for their professional work, referring also to media convergence, which is a result of development of digital technologies. Media convergence is precisely what caused their way of work to change, as well as the need for specific knowledge and skills like special systems and programmes for editing portals, which particularly refer to text and photography editing, today one of the most significant forms of information sources. They do not consider necessary nor decisive that a good journalist has higher education, but that it can be an upgrade of their work. They see the upgrade and training of their journalistic work in courses, seminars, workshops and similar, in which most of the subjects also participated; and that the knowledge of foreign languages, especially English language, is of extreme importance for quality work in the journalistic profession. Social networks represent a necessary tool for them in modern journalistic work, through which they can retrieve information in the fastest and the easiest way, and it is also the fastest way to publish information. As additional options of use of social networks, a very small number of subjects state that they use live broadcasting as one of the additional possibilities of social networks.

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INTERNACIONALNA POSLOVNO-INFORMACIJSKA AKADEMIJA TUZLA