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„S novim saznanjima dolaze nov način razmišljanja i nova rešenja problema za koje nismo ni znali da postoje. Sa novim saznanjima dolaze novi izazovi i nove definicije.“

Senior, J., & Gyarmathy, E. (2021)

Uvodna reč

Poštovane kolege,

Važnost i uticaj tehnologije i naučnih osnova na kojima je ona izgrađena ne može se preceniti. Moramo biti proaktivni kako bismo obezbedili da vrednosti koje su ugrađene u današnje tehnologije budu jasne i saopštene ljudima koji ih koriste za podsticanje

odgovornih inovacija i obezbeđivanje napretka za celo društvo. Iako studenti mogu da koriste različita IT rešenja u svoje slobodno vreme, obrazovne institucije treba da im pruže pristup najsavremenijim tehnologijama u sklopu školovanja kako bi im bilo omogućeno da budu upoznati sa aktuelnostima, i kako bi njihovi projekti bili što uspešniji i njihovo iskustvo učenja poboljšano.

Učenje koje inicira i usmerava učenik je često najefikasniji tip učenja. Pristup svih studenata opremi za virtuelnu realnost i moćnim računarima je moguć samo ako obrazovne institucije učine ove alate dostupnim. Studenti koji nemaju direktan pristup ovim tehnologijama u privatnom životu, van škole, moraju imati mogućnost da im pristupe kroz univerzitetske računarske laboratorije ili učionice. Dostupnost tehnologije i adekvatne aktivnosti nastavnika su suštinski podsticaj razvoja u oblasti obrazovnih tehnologija. Pored toga, ključno je da donosioci odluka u školama poznaju mogućnosti tehnologije i mesta njihove primene kako bi se nabavila i implementirala odgovarajuća tehnologija i tako ostvario njen najveći učinak na dobrobit svih učesnika u obrazovnom procesu.

Studenti i nastavnici su već pod uticajem inovacija iz domena informacionih tehnologija na fakultetima i univerzitetima. Primena informacionih tehnologija se može videti u najrazličitijim oblastima obrazovanja. Sada je, recimo, moguće u punom kapacitetu koristiti napredne platforme i tehnologije virtuelne realnosti, kao što su laboratorije virtuelne stvarnosti, i u medicinskim školama. Međutim, da bi ovaj metod nastave uspeo, učenik mora biti motivisan i voljan da se potruži. Pored toga, nastavnik mora biti upoznat sa mogućnostima tehnologije kako bi je implementirao u nastavi, što će, kroz kreativan pristup prenošenju znanja, dovesti do veće motivacije učenika da se potruži.

Veliki broj različitih stilova učenja učenika i njihove potrebe biće prepoznati kroz naprednu analitiku podataka, a nastavni proces će im se prilagođavati kroz sve personalizovaniju pedagogiju. U kombinaciji sa edge computingom, imersivna vizuelizacija će omogućiti da se studentima obezbedi personalizovano iskustvo učenja. Postizanjem visokog stepena personalizacije uradićemo mnogo za motivaciju učenika i usvajanje znanja, koji su čvrsto povezani.

Svi mi koji radimo u obrazovanju imamo ogroman potencijal da promenimo obrazovne standarde i metode. Zbog toga, na nama je da pokrenemo promene u svojoj zajednici, školi, kampusu i učionici. Moramo se suočiti sa novim izazovima i definicijama koje nove tehnologije i nova saznanja donose. Nema boljeg trenutka da to učinimo od sadašnjeg.

dr Valentin Kuleto


dr Valentin Kuleto



"With new knowledge come new thinking and new solutions to problems we did not realise existed. With new knowledge come new challenges and definitions."

Introductory

Senior, J., & Gyarmathy, E. (2021)

Distinguished colleagues,

The importance of technology and the scientific foundations on which it is built cannot be overstated. It is not enough to only focus on the outcomes of other people's decisions. We must be proactive in ensuring that the values

embedded in today's technologies are made clear and communicated to the people who use them to foster responsible innovation and ensure progress for the whole society. Even though students can use various IT solutions in their spare time, educational institutions should provide them access to cutting-edge technologies on campus to help them be successful in their projects and to enhance their learning experience.

Learning initiated and directed by the learner is frequently the most effective type of learning. Widespread student access to virtual reality headsets and powerful computers is possible only if educational institutions make these tools available. Students who do not have direct access to these technologies in their lives outside school must be able to access this technology through university computer labs or classrooms. The availability and accessibility of technology are essential requirements for encouraging development in the educational technology field while students are on their formal education path. In addition, school decision-makers need to recognise the possibilities of technology and their places of application in order to achieve the greatest impact, which would encourage the management of these institutions to make the necessary investments. The mission of our journal is to help decision-makers to more effectively learn about the potential of modern educational technologies and recognise their benefits.

Students and teachers are already being influenced by information technology innovations at colleges and universities. Their implementation can also be seen in a variety of fields of education. It is now possible to use, for instance, advanced virtual reality platforms and technologies, such as virtual reality labs, to their fullest extent even in nursing and medical schools. However, for this method to succeed, the student must be motivated and willing to make an effort. In addition, the teacher must be familiar with the possibilities of technology in order to implement it in teaching, which will, through a creative approach to the transfer of knowledge, lead to greater motivation of students to make an effort.

A growing number of learning styles will be discovered through advanced data analytics and personalised enhanced pedagogy. In conjunction with edge computing, immersive visualisation will soon make it possible to deliver a personalised learning experience directly to a student's vision. Students' motivation and knowledge retention are firmly linked, but the true potential lies in achieving a high degree of personalisation in the learning experience.

We all have the potential to revolutionise educational standards and methods. For this reason, it is up to us to initiate the changes in our community, our school, campus, our classroom. We must face new challenges and definitions brought about by new technologies and new knowledge. There is no better moment to start than now.

Dr Valentin Kuleto


Editor in Chief

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Razvoj analitičke baze podataka za potrebe analize uticaja pandemije koronavirusa na tržište rada u Srbiji

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Sažetak: Pandemija izazvana virusom COVID-19 negativno se odrazila na stopu ekonomskog rasta i ugrozila mnoga radna mesta. Da bi se sagledao uticaj pandemije koronavirusa na tržište rada u Srbiji, u ovom radu prikazan je postupak razvoja analitičke baze podataka. U fazi analize korišćeni su javno dostupni podaci Republičkog zavoda za statistiku. Rad je strukturiran u tri poglavlja. Nakon uvoda, u prvom poglavlju prikazan je uticaj pandemije koronavirusa na privredu u svetu i Srbiji. U okviru drugog poglavlja date su teorijske postavke koje se odnose na sisteme za podršku odlučivanju i poslovnu inteligenciju. U okviru trećeg poglavlja prikazan je razvoj analitičke baze podataka za potrebe analize uticaja pandemije koronavirusa na tržište rada u Srbiji. U okviru ovog poglavlja opisan je proces prikupljanja podataka i njihove transformacije, kao i učitavanja podataka u analitičku bazu podataka. Takođe, prikazane su i analize podataka koje govore o uticaju pandemije koronavirusa na tržište rada u Srbiji. Za potrebe razvoja i implementacije analitičkog modela podataka korišćen je softverski alat Microsoft Excel i Microsoft Power BI. Priprema podataka za učitavanje u analitičku bazu izvršena je u Microsoft Excelu, dok je za analitički deo korišćen Microsoft Power BI.

Ključne reči: vanalitički model podataka, COVID-19 pandemija, tržište rada, nezaposlenost, industrijske grane

1. Uvod

Pandemija izazvana virusom COVID-19 dovela je do velikog pada ekonomske aktivnosti širom sveta i izazvala ekonomsku krizu koja se odrazila na sve segmente poslovanja. Sektori koji su najviše ugroženi ovom pandemijom su oni koji i zapošljavaju najveći broj radnika širom sveta, poput sektora turizma i ugostiteljstva, prevoza putnika, kao i mnogih drugih.

Projekcija Organizacije za ekonomsku saradnju i razvoj (OECD) pokazala je da će stopa nezaposlenosti biti mnogo veća nego na vrhuncu globalne finansijske krize 2008. godine. Na osnovu javno dostupnih podataka, najugroženije grupe su niskokvalifikovani, mlađa populacija i žene. Kako bi izbegle kolaps u momentima potpune blokade svetske ekonomije, mnoge kompanije su morale da pređu na rad od kuće i onlajn obavljanje radnih zadataka. Zbog sprečavanja širenja virusa i očuvanja zdravlja stanovnika, države su uvele radikalne mere. Zatvarane su granice, kretanje ljudi je bilo svedeno na minimum, čak se i uvodio policijski čas u određenim periodima; u nekim državama, policijski čas još uvek traje. Sve ovo dovelo je do toga da kompanije po potrebi zatvaraju određene sektore, što je dovelo do velikog broja otkaza, smanjenja plata i generalno pada proizvodnje proizvoda ili usluga. Samim tim što su velike kompanije prestajale sa radom ili radile na minimumu kapaciteta, i ostale, manje firme su pogođene na isti način. Krajem prve trećine 2020. godine, u momentima kada se smatralo da je pandemija u punom jeku, došlo je do privremenog kompletnog zatvaranja država i obustave rada. Privreda u našoj zemlji funkcionisala je na minimumu kapaciteta, veliki broj stranih firmi je veći deo svojih zaposlenih prebacio na takozvani „rad od kuće“, dok su proizvodni pogoni uglavnom bili zatvarani u potpunosti. Države su morale da pronađu način kako da sačuvaju privredu, a samim tim i svetsku ekonomiju, te su u dogovoru sa kompanijama isplaćivale novčanu pomoć za sve zaposlene radnike privatnog i javnog sektora. Na taj način su uspele da sačuvaju veliki broj radnika i spreče potpuni kolaps.

2. Uticaj pandemije koronavirusa na privredu u svetu

Svetska ekonomija se od početka prošle godine suočava sa najvećim izazovom još od svetske ekonomske krize iz 2008. godine. Predviđa se da će ove godine širenje virusa ozbiljno uticati na ekonomiju i sigurnost radnih mesta, premda su se te posledice već osetile i u prethodnoj godini u svim segmentima. Najviše su pogođena globalna finansijska tržišta, putnička industrija, avio-industrija, industrijska proizvodnja, prodaja, investicije, ugostiteljstvo itd. [1].

Direktorka MMF-a Kristalina Georgieva izjavila je da će ekonomski rast biti niži za 0,5% u odnosu na predviđenih 3,3% u 2020. godini (Slika 1). Procene S&P-a izgledaju još ozbiljnije. Naime, njihova predviđanja su da će ekonomski rast pasti na samo 0,4% u odnosu na očekivanih 3,3%, što bi predstavljalo najsporiji rast još od ekonomske krize davne 1982. godine. S&P veruje da su mere koje su usvojene za suzbijanje virusa gurnule globalnu ekonomiju u recesiju [6].



Slika 1. Stopa ekonomskog razvoja u svetu [8]

Još jedna organizacija koja se oglašila povodom nove procene stopa ekonomskog razvoja za 2020. godinu je i OECD – Organizacija za ekonomsku saradnju i razvoj. Na grafikonu iznad prikazane su njihove procene. Kao što možemo videti, procene OECD-a su da će kineska ekonomija porasti za samo 4,9% u odnosu na ranije predviđenih 5,7%. Ono što je karakteristično za trenutnu krizu je to da je ovo prva kriza u istoriji koja je ovako brzo uspela sve da pogorša na globalnom nivou. Kriza izazvana pandemijom koronavirusa teško će pogoditi svetsku ekonomiju, a posledice već svi osećamo na direktan ili indirektan način.

Ova epidemija izazvala je ekonomske posledice delimično i zbog drastičnih mera koje su vlasti širom sveta preduzele kako bi se sprečilo širenje virusa. Na primer, jedna od restriktivnih mera koje je Kina sprovedla bila je i zatvaranje kompanija širom zemlje. Ovo je imalo veliki uticaj na ekonomske aktivnosti u svetu, zato što veliki deo svetske proizvodnje zavisi od uvoza delova iz Kine.

Ministar ekonomije Francuske Bruno Le Mer smatra da je epidemija događaj koji u potpunosti menja trenutni razvoj. Izbijanje i posledice širenja virusa otkrili su nerazumnu zavisnost čitavog sveta od Kine. Mnogi sektori već dugo zavise od kineskih sirovina ili proizvoda. Na primer, 95% snabdevanja električnim baterijama i 80% sirovina u zdravstvenoj industriji dolazi iz Kine ili Azije [8].

Još jedna industrija koja je posebno pogođena prethodno pomenutim merama je svetska automobilska industrija. Naime, prema istraživanju koje su sprovedli He i Zill, uticaj zaustavljanja proizvodnih pogona u Kini proširio se kao domino-efekat na ostatak sveta. Zbog uvedenih mera, Kina je smanjila prodaju automobila u zemlji za čak 92%. Kompanija Tesla odložila je datum početka proizvodnje novog modela 3, dok je Volkswagen odložio proizvodnju u svim svojim kineskim pogonima koji su u partnerstvu sa SAIC Motorsom. U februaru 2020. godine, južnokorejski Hyundai postao je prvi veći proizvođač automobila koji je privremeno zaustavio proizvodnju zbog nedostatka delova; 7. aprila, kompanija Nissan Motors je objavila da je otpustila oko 10.000 radnika u Sjedinjenim Državama; Honda je najavila da će polovina zaposlenih u Americi otići na privremeno odsustvo. Posledice se osećaju i na japanskom tržištu. Prema rečima Japanskog udruženja za proizvodnju automobila, japansko tržište novih vozila opalo je za 9,2%. Posledice krize nisu zaobišle ni evropsko tržište automobila. Prekid u proizvodnji najviše su pogodili zaposlene u Nemačkoj, zatim Francuskoj, Italiji i Španiji. Na osnovu istraživanja Evropskog udruženja proizvođača automobila (ACEA) za uticaj krize na evropsku automobilsku industriju, koje pokriva zemlje Evropske unije kao i Ujedinjeno Kraljevstvo, oko 1.200.000 radnih mesta samo u automobilskoj proizvodnji pogođeno je zaustavljanjem fabrika, a ova privremena gašenja proizvodnje dovela su do gubitka skoro 2.400.000 motornih vozila. Uprkos postepenim smanjenjima ograničenja u vezi sa pandemijom i postepenom vraćanju određenih pogona u zemljama Evropske unije, trebaće dosta vremena da se automobilska industrija vrati normalnom funkcionisanju. Kao i auto-industrija, tako i svi ostali delovi svetske privrede moraju proširiti mrežu dobavljača i ne smeju dozvoliti da zavise samo od jedne zemlje ili regiona [8].

Pandemija koronavirusa izazvala je globalnu zdravstvenu krizu, koja se ubrzo pretvorila u krizu na ekonomskom nivou koja je kasnije dovela do globalne krize na tržištu rada. Kako je pandemija nastavila da se razvija uz sve gore prognoze zdravstvene organizacije, svaka procena stanja na tržištu rada je postala sve neizvesnija, a projektovanje mogućih načina razvijanja poslovanja nemoguće.

U ovakvim situacijama ne možemo a da se ne oslonimo na podatke iz perioda velike ekonomske krize 2008–2009. Tada je oporavak zaposlenosti bio još sporiji i bolniji, što je kasnije doprinelo usporavanju ekonomskog razvoja i rasta produktivnosti. Bilo je potrebno više od decenije da se stopa nezaposlenosti vrati na nivo na kojem je bila pre krize, dok se mlađa populacija nikad nije potpuno oporavila od krize. Moglo bi se reći da su ekonomija i zapošljavanje postali nepovezani, i dok je produktivnost rada nastavila da raste, zarade i prihodi od rada su dosta zaostajali. Kao rezultat, dobili smo nejednakost koja i dalje nastavlja da raste. Samim tim, došlo se do zaključka da je tada prihvaćena „ekonomija kapanja“, odnosno princip „Ne treba da sipa, neka kaplje“, bila veliki neuspeh, tako da ovakve greške ne bi trebalo da se ponove u trenutnoj krizi na tržištu rada [8].

Prema nekim podacima [6], tvrdi se da trenutni broj zaposlenih na svetskom nivou iznosi oko 3,3 milijarde, a da je od toga 2 milijarde posluje u neformalnoj, odnosno „sivoj“ ekonomiji, što je otprilike 62%. Procenjuje se da će od ove 2 milijarde na čak 1,6 milijardi znatno uticati trenutna kriza, zbog mera zaključavanja ili rada u sektorima visokog rizika.

Veliki broj mladih ljudi pogođen je novonastalom situacijom. Nezaposlenost je uticala na čak 67,6 miliona mladih ljudi širom sveta, što predstavlja 13,7 odsto ukupne omladinske radne snage. Mnogo veći broj omladinske radne snage nije ni bio zaposlen u momentu izbijanja pandemije, a više od tri četvrtine mladih je bilo zaposleno u neformalnoj ekonomiji, što ih čini izuzetno ranjivim u ovakvim situacijama [6].

Dakle, može se zaključiti da kriza izazvana koronavirusom ozbiljno utiče na mlade na tri načina:

- » prekidi obrazovanja, obuka i učenja zasnovanih na radu;
- » povećane poteškoće za novoprijavljene na tržištu rada;
- » gubici posla i dohotka.

Na početku krize, 178 miliona mladih bilo je zaposleno u sektorima kao što su smeštaji i usluge prehrane i trgovine na malo. Mere za suzbijanje virusa dovele su do smanjenja broja radnih sati, otpuštanja i velikog gubitka prihoda, a prema globalnoj anketi koju je sprovedla ILO – Međunarodna organizacija rada, oko 30 miliona je prestalo da radi od početka krize [7].

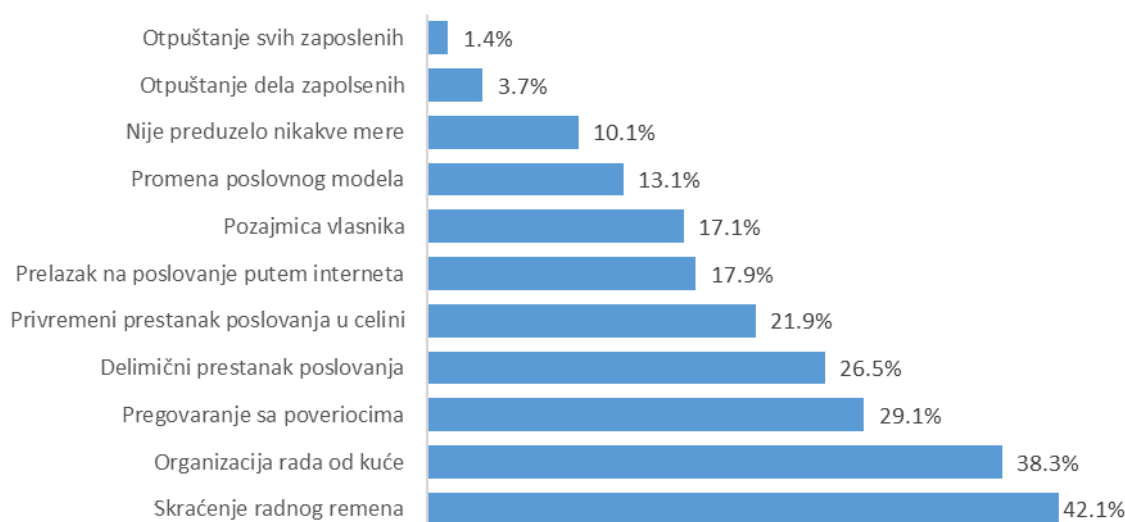
Pandemija je takođe pokazala i veliku nejednakost polova na tržištu rada u uslovima pandemije. Iako je postojao određeni napredak tokom prethodnih decenija, rodne razlike su bile značajne na tržištima rada širom sveta čak i pre krize. Tu spadaju razlike u učešću radne snage, platama i kvalitetu zaposlenja. A sada kriza izazvana kovidom nesrazmerno utiče na žene u poslovnom svetu, i to na sledeća četiri načina [7]:

- » Gotovo 510 miliona, odnosno 40% svih zaposlenih žena širom sveta radi u teško pogođenim sektorima (što se tiče muškaraca, taj procenat je nešto niži i iznosi 36.6%).
- » 55 miliona, odnosno 73,2 odsto zaposlenih koji se vode kao domaći radnici, izloženi su riziku gubitka posla i prihoda zbog blokada i nedostatka pokrića socijalnim osiguranjem.
- » Žene predstavljaju više od 70% zaposlenih u zdravstvu i socijalnom radu. Iako predstavljaju većinu radnika u sektorima koji se najviše susreću sa virusom, veliki broj njih je na nižekvalifikovanim i slabije plaćenim pozicijama.
- » Na kraju, i zatvaranje centara za obrazovanje, službi za negu i škola, kao i potreba za pružanjem podrške starijim rođacima, pogoršali su nejednaku raspodelu.

Prema izveštaju Međunarodne organizacije rada [1], kriza izazvana pandemijom koronavirusa, najviše je uticala na pad poslovanja u svetu u sektoru usluga smeštaja i ishrane, prerađivačkoj industriji, trgovini, posredovanju nekretninama, administrativnim i poslovnim delatnostima, kao i ostalim uslužnim delatnostima, čime je ugroženo 38% radne snage. U ovim sektorima u Srbiji je u 2019. bilo zaposleno 1.297.400 ljudi (47,5% ukupno zaposlenih), dok je u sektorima za koje je pad procenjen kao umereno visok bilo zaposleno 201.400 ljudi.

Prema izveštaju Svetske banke [2], polazeći od broja zaposlenih po sektorima, predviđa se da će se uticaj koronavirusa u Srbiji najviše osetiti kroz proizvodnju trajnih dobara, jer je 19% radne snage u Srbiji zaposleno u prerađivačkoj industriji. Prema istom izveštaju, proizvođači-izvoznici zapošljavaju najveći broj radnika, u poređenju sa drugim sektorima na koje bi kriza mogla da utiče. Zbog pada izvoza i sve složenijeg uvoza sirovina tokom pandemije, tražnja za trajnim dobrima često pada u uslovima velike krize.

Sektor usluga je jedan od najviše pogođenih sektora u svetu. U Srbiji su takođe posledice krize najviše osetile uslužne delatnosti i manje firme. Prema ispitivanju koje je sprovedla Privredna komora Srbije zajedno sa USAID (slika 2), 22% ispitanika je privremeno obustavilo svoje poslovanje, dok je 26,6% njih delimično obustavilo svoje poslovne aktivnosti. Od ukupnog broja ispitanika, polovina je izjavila da su im prihodi u martu 2020. bili manji za više od 50% u poređenju sa 2019. godinom, dok je za jednu trećinu ispitanika prihod bio manji za 80% [2].



Slika 2. Koraci koje su firme u Srbiji preduzele usled smanjenja poslovanja izazvanog pandemijom koronavirusa, u % [1]

Prema istom istraživanju, oko 35% samozaposlenih preduzetnika i mikropreduzeća izrazilo je bojazan od pada prihoda za oko 80% u odnosu na mart 2019; oko 7% srednjih preduzeća i 15% velikih firmi navelo je da očekuje pad prihoda u istom obimu. Iako značajan broj ispitanika oseća velike posledice pandemije, svega 5,1% ispitanika je izjavilo da je otpustilo sve ili deo radnika (slika 2). Od toga, 13,2% firmi je u sektoru turizma i ugostiteljstva, 10,1% u stručnim, naučnim, inovacionim i tehničkim i administrativnim delatnostima, 7,5% je iz oblasti trgovine i 7,7% iz oblasti građevinarstva [3].

Smanjenje broja zaposlenih nastalo je kao posledica smanjenja obima poslovanja. Najveći pad obima poslovanja zabeležen je u sektoru trgovine i ugostiteljstva: 94,9%, a u oblasti trgovine zabeležen je pad od 65,6%. Pad od 64% zabeležile su firme koje se bave proizvodnjom hrane i pića. Takođe, drastičan pad obima poslovanja zabeležen je i kod 83,6% firmi u kreativnoj industriji, 44,8% u stručnim, naučnim, inovacionim i tehničkim delatnostima, i 36,4% u IT sektoru [4]. Prema podacima Nacionalne službe za zapošljavanje, smanjenje tražnje na tržištu rada koje je primećeno tokom aprila i marta može da dovede do rasta nezaposlenosti [5].

Sa ciljem da se izvrši analiza uticaja pandemije koronavirusa na tržište rada u Srbiji, u narednim poglavljima biće prikazane teorijske osnove analitičkih i relacionih baza podataka i opisan proces izgradnje analitičke baze podataka za potrebe ovog rada.

3. Sistemi za podršku u donošenju poslovnih odluka i poslovna inteligencija (business intelligence – BI)

Sistem za podršku u odlučivanju (DSS) je informacioni sistem koji pomaže poslovnim sistemima u aktivnostima donošenja odluka koje zahtevaju prosudbu, odlučnost i redosled radnji [18]. Svrha sistema za podršku u odlučivanju je da stvara detaljne informativne izveštaje prikupljanjem i analizom podataka, te se on razlikuje od uobičajene operativne aplikacije koja služi za prikupljanje podataka ali ne i njihovu analizu. Sistemi za podršku odlučivanju imaju visoku primenu u svim sektorima preduzeća. Jedna od glavnih primena u organizaciji je izveštavanje u realnom vremenu. Ovo se najbolje vidi prilikom planiranja zaliha i upravljanja zalihama iz minuta u minut. U ovakvom sistemu zaliha, organizacija zahteva podatke u realnom vremenu o nivoima zaliha kako bi one bile popunjene „tačno na vreme“. Time se sprečavaju kašnjenja u proizvodnji i izbegava se takozvani domino efekat [16].

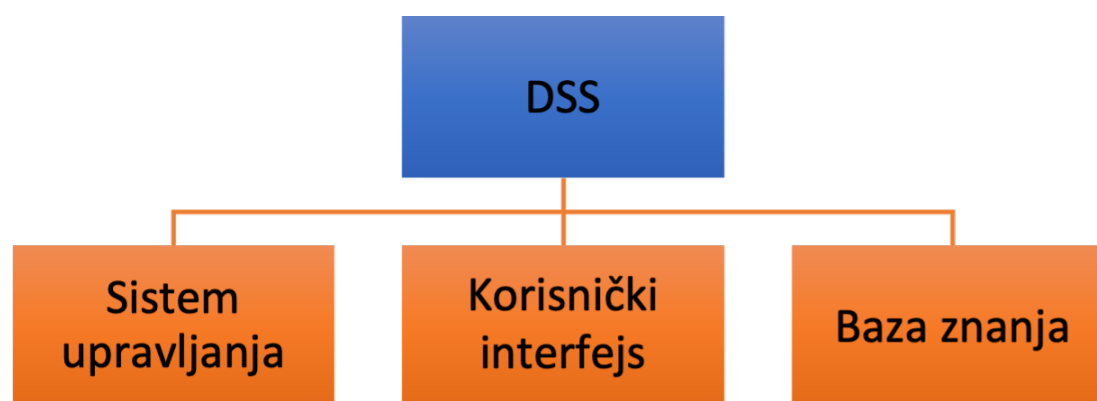
Sistemi za podršku odlučivanju (DSS) i poslovna inteligencija (BI) često su povezani. Stručnjaci smatraju BI za naslednika DSS-a, pošto su sistemi za podršku u odlučivanju poznati kao jedan od elemenata sistema poslovne inteligencije zajedno sa skladištenjem i rudarenjem podataka (data mining) [19, 20, 21]. Dok je BI široka kategorija aplikacija, usluga i tehnologija za

prikupljanje, skladištenje, analizu i pristup podacima za donošenje odluka [22], DSS aplikacije su ipak više namenjene za podršku određenim odlukama. Na primer, poslovni DSS može pomoći kompaniji da projektuje prihod tokom određenog perioda analizom podataka o prošloj prodaji i trenutnih promenljivih [19].

DSS ima tri glavne komponente u svom sistemu [19] (slika 3):

- » Sistem upravljanja modelima – ova komponenta čuva modele koji se mogu koristiti u donošenju odluka. Ovi modeli se koriste pri donošenju odluka prilikom predviđanja potražnje za robom ili uslugom. Postoje različiti tipovi modela podeljeni na osnovu njihove primene:
 - » Statistički modeli – Koriste se uspostavljanje veza između događaja i faktora povezanih sa tim događajem. Na primer, koriste se pri analizi promena na tržištu po nekoj određenoj kategoriji.
 - » Model analize osetljivosti – Modeli se koriste kada se rade analize „Šta ako?“. Dakle, služe za analize u kojima je potrebno predvideti krajnji rezultat nečega.
 - » Analize optimizacije – Koriste se za pronalaženje optimalne vrednosti.
 - » Model predviđanja – Ovde spadaju modeli regresije, analize vremenskih serija i drugi modeli koji se koriste za analizu poslovnih planova.
- » Korisnički interfejs – komponenta koja sadrži alate potrebne krajnjem korisniku sistema za podršku u odlučivanju kako bi lako upravljao sistemom.
- » Baza znanja – uključuje informacije iz unutrašnjih izvora (informacije prikupljene u procesu transakcija) i spoljašnjih izvora (onlajn baze podataka) [16].

U mnogim zajednicama epidemija se ne prihvata i ne priznaje zato što ugrožava specifične socijalne, ekonomske i institucionalne interese [11]. Ako do epidemije ipak dođe, autor primećuje obrazac koji se ponavlja već vekovima: doktori identifikuju nekoliko „sumnjivih“ slučajeva i zadržavaju svoju zabrinutost za sebe ili svoje sumnje prijavljuju nadležnima, koji obično nerado priznaju prisustvo jednog tako opasnog uljeza u javnosti [11]. Epidemija velikih boginja u Jugoslaviji suočila se sa istim problemom.



Slika 3. Glavne komponente sistema za podršku u odlučivanju [15]

Sistemi za podršku u odlučivanju imaju svoje prednosti i mane. Prednosti sistema za podršku odlučivanju su sledeće:

- » samim tim što vrši prikupljanje i analizu podataka u realnom vremenu, DSS povećava brzinu i efikasnost donošenja odluka;
- » promoviše obuku unutar organizacije, pošto se moraju razviti posebne veštine za primenu i vođenje sistema unutar organizacije;
- » automatizuje tradicionalne upravljačke procese tako da menadžeri imaju više vremena da se usredsrede na donošenje odluka;
- » poboljšava međuljudsku komunikaciju unutar organizacije.
- » Mane sistema donošenja odluka su:
 - » troškovi razvoja i primene DSS-a su veliki, što ove sisteme čini manje dostupnim manjim organizacijama;
 - » kompanija može da dođe u situaciju preterane zavisnosti od ovih sistema, pošto menadžeri imaju tendenciju da se previše oslanjaju na njih te se tako gubi subjektivni aspekt odlučivanja;
 - » sistem može dovesti do preopterećenja informacijama, pošto teži da razmotri sve aspekte problema; time stvara dilemu za krajnje korisnike, jer im ostavlja više opcija;
 - » implementacija ovih sistema može izazvati negativnu reakciju kod zaposlenih na nižim nivoima; mnogi od njih odbijaju da prihvate nove tehnologije zbog straha od gubitka posla [16]

S druge strane, poslovna inteligencija, odnosno BI je skup procesa, arhitekture i tehnologija koji pretvaraju prikupljene podatke u korisne informacije za krajnjeg korisnika [20]. Ovaj izraz poslovne analitike često se odnosi i na niz alata koji pružaju brz i lak uvid u trenutno stanje kompanije kao organizacije na osnovu dostupnih podataka [17]. Poslovna inteligencija je deskriptivna i govori nam šta se trenutno događa, kao i šta se dešavalo u prošlosti što je dovelo do trenutnog stanja. Nekada su alate za poslovnu inteligenciju mogli da koriste samo stručnjaci u domenu informacionih tehnologija, međutim, kako su BI alati postali intuitivniji i jednostavniji za upotrebu, njihovo korišćenje omogućeno je velikom broju korisnika iz različitih organizacionih domena. Dakle, postoje dva tipa poslovne inteligencije. Prvi je tradicionalni BI, gde IT stručnjaci koriste unutrašnje transakcione podatke za kreiranje izveštaja. Drugi tip je moderni BI, gde poslovni korisnici pomoću intuitivnih sistema analiziraju podatke mnogo brže.

Organizacije se još uvek uglavnom odlučuju za tradicionalni tip BI-a kod određenih tipova izveštaja. Na primer, kod periodičnih finansijskih izveštaja, pošto su skupovi podataka uglavnom standardni i predvidivi. Što se tiče modernog BI-a, organizacije koriste ovaj tip kada je potreban uvid u stanje u realnom vremenu, pošto se ono stalno menja. Razlog za ovo je brzina odgovora koja je potrebna kako bi se dobili što tačniji rezultati.

Postoji nekoliko tehnika poslovne inteligencije koje kompanije mogu koristiti za dobijanje korisnih podataka koje će kasnije iskoristiti prilikom donošenja odluka.

U daljem tekstu biće predstavljene najzastupljenije tehnike:

- » Analitika – Ovo je tehnika poslovne inteligencije koja podrazumeva proučavanje dostupnih podataka kako bismo imali uvid u trendove i stanja na tržištima. Tehnika analitike kompanijama služi da razumeju podatke kojima raspolažu i da na

osnovu tih podataka donose bolje poslovne odluke.

- » Prediktivno modeliranje je tehnika koja se koristi statističkim parametrima za stvaranje modela koji će biti iskorišćeni za predviđanje budućih trendova. Pomoću prediktivnog modeliranja moguće je predvideti buduću vrednost nekog podatka, kao i njegove attribute.
- » OLAP, odnosno onlajn analitička obrada podataka, jeste tehnika za rešavanje analitičkih problema različitih dimenzija. Najvažniji aspekt analitičke obrade podataka je višedimenzionalni pristup podacima koji omogućava korisnicima da uoče probleme iz različitih perspektiva. OLAP svoju primenu nalazi u analizi podataka o upravljanju odnosima sa klijentima, određivanju budžeta, finansijskom predviđanju itd.
- » Data mining je tehnika koja služi za otkrivanje obrazaca u ogromnim skupovima podataka i često uključuje sisteme baza podataka, statistiku i mašinsko učenje kako bi se pronašli ti obrasci. Rudarenje podataka je sastavni proces upravljanja podacima jer obezbeđuje odgovarajuće struktuiranje podataka.
- » Vizualizacija modela – ova tehnika koristi se za predstavljanje otkrivenih činjenica grafičkim prikazima, kao što su histogrami, grafikoni, mape i drugo [17].

Alati poslovne inteligencije razvijeni su kako bi pomogli korisniku da bolje razume podatke. Pravilno razumevanje podataka dovodi do boljih poslovnih odluka. Spomenućemo neke od najzastupljenijih BI alata.

- » SISENSE – ovaj softver, odnosno alat poslovne analitike je vrlo lak za korišćenje. Omogućava svima u organizaciji da upravljaju složenim skupovima podataka, analiziraju ih i predstave, bez potrebe za angažovanjem IT odeljenja. Zbog tehnologije koju koristi, ovaj alat pruža bržu obradu podataka u poređenju sa ostalim alatima.
- » SAP Business Intelligence nudi niz naprednih analitičkih rešenja, uključujući mašinsko učenje, prediktivnu analitiku, predviđanje i analizu. Ova aplikacija na nivou kompanije za klijent/server sisteme nudi vizualizaciju i analitiku podataka, izveštavanje i analizu, mobilnu analitiku i kancelarijsku integraciju. Namenjena je višim sektorima u kompanijama.
- » Dundas BI je alat za poslovnu analitiku, koji se koristi onlajn i omogućava korisnicima da povežu više izvora podataka u realnom vremenu. Pruža odlične prikaze preko tabela i grafikona koji se mogu pregledati i preko drugih radnih površina i uređaja.
- » Power BI – ovaj alat pruža cloud-based BI usluge. Power BI Services zajedno sa desktop aplikacijom Power BI Desktop, pored mogućnosti analize i obrade podataka, nudi i mogućnost skladištenja i povezivanja podataka sa više izvora. Ključne komponente ovog alata pored gore navedenih su i Power BI Mobile Apps, Power BI Gateway, Power BI Embedded, Power BI Report Server i Power BI Visuals Marketplace. [17]

U ovom radu, za potrebe analize uticaja pandemije koronavirusa na tržište rada u Srbiji korišćeni su alati Power BI i Microsoft Excel, što je i opisano u narednom poglavlju.

4. Razvoj analitičke baze podataka

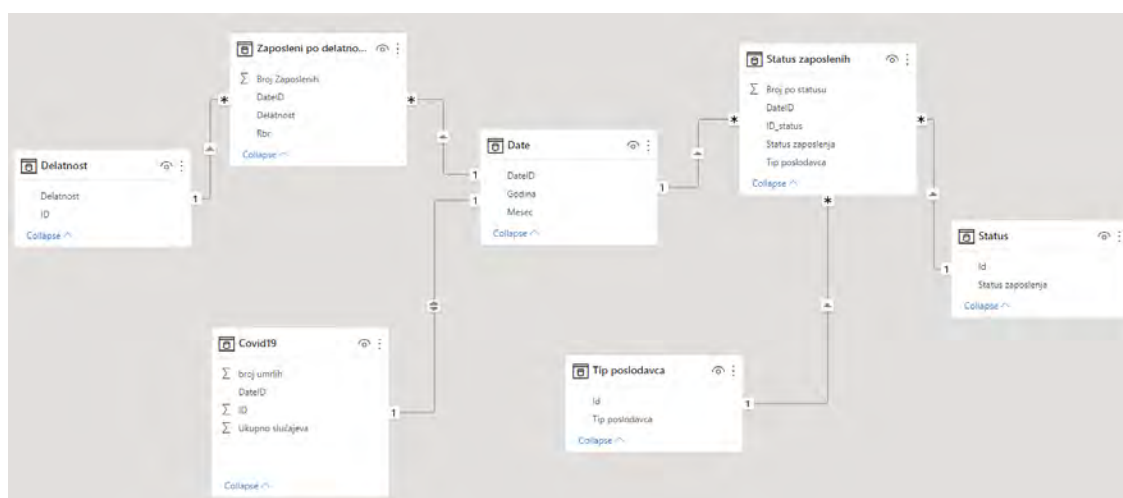
4.1. Prikupljanje podataka za analizu uticaja koronavirusa na tržište rada

Za potrebe analize uticaja koronavirusa na tržište rada u Srbiji korišćeni su podaci dostupni na zvaničnom sajtu Republičkog zavoda za statistiku Republike Srbije, kao i veb-stranicama koje prate podatke u vezi sa brojem obolelih i preminulih od COVID-19 [9, 10, 14]. Sa sajta Republičkog zavoda za statistiku preuzeti su mesečni statistički bilteni koji sadrže podatke o kretanju broja zaposlenih po mesecima, kao i evidenciju broja nezaposlenih [5, 12]. Analiza uticaja pandemije COVID-19 na tržište rada u Srbiji urađena je za period od januara 2019. do septembra 2020. godine.

Najvažniji korak u izradi analitičkog modela bio je proces pripreme i transformacije podataka za dalju analizu. U tom kontekstu, dostupni podaci učitani su u MS Excel, gde je pomoću alata Power Query izvršena njihova transformacija i priprema za učitavanje u softver MS Power BI. Na ovaj način kreirane su sve tabele dimenzija, kao i tabele činjenica. Svakoј tabeli dodeljen je adekvatan naziv na osnovu onoga što ta tabela sadrži.

4.2. Razvoj analitičkog modela podataka

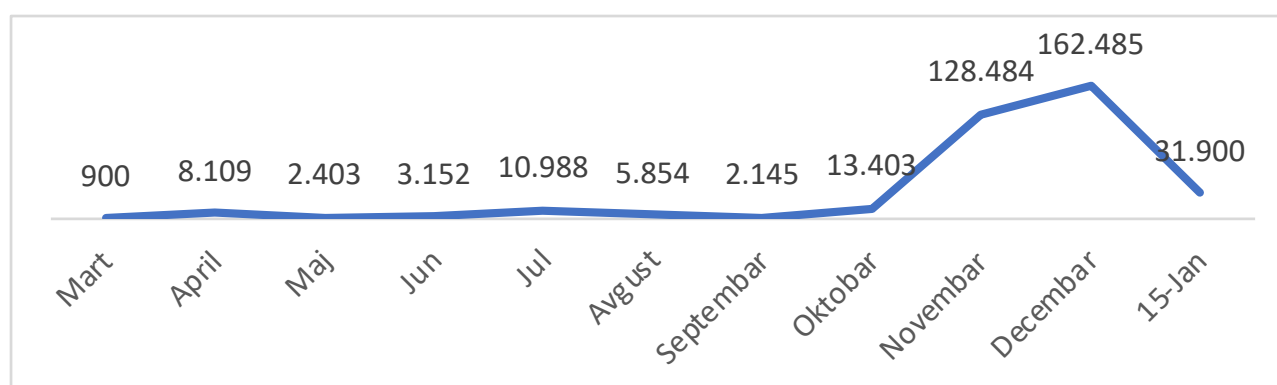
Sa ciljem da se sagleda uticaj pandemije COVID-19 na tržište rada u Srbiji kreiran je analitički model podataka. Zbog strukture ulaznih podataka, za potrebe analize uticaja pandemije na tržište rada u Srbiji kreirane su dve tabele činjenica, od kojih je jedna omogućila analize po delatnostima (ZaposleniPoDelatnostima), a druga analize po statusu zaposlenja (StatusZaposleni), (slika 4). Takođe, na osnovu dostupnih podataka kreirane su i sledeće tabele dimenzija: Tip poslodavca, Status zaposlenja, Naziv delatnosti i tabela Date. Na slici 4 prikazan je analitički model podataka kreiran u softveru Power BI koji je bio osnova za dalje analize.



Slika 4. Analitički model

4.3. Analize uticaja pandemije koronavirusa na tržište rada u Srbiji

Na osnovu analitičkog modela podataka i javno dostupnih podataka, urađene su analize uticaja pandemije koronavirusa na tržište rada u Srbiji. Analizom su obuhvaćeni meseci od marta do septembra 2019. i 2020. Razlog je taj što je u martu 2020. u Srbiji proglašena pandemija, a već u aprilu mesecu u Srbiji je proglašeno vanredno stanje. Nakon popuštanja mera, broj obolelih i preminulih naglo počinje da raste da bi, prema zvaničnim podacima, najveći broj i jednih i drugih bio zabeležen tokom jula meseca 2020 (slika 5).

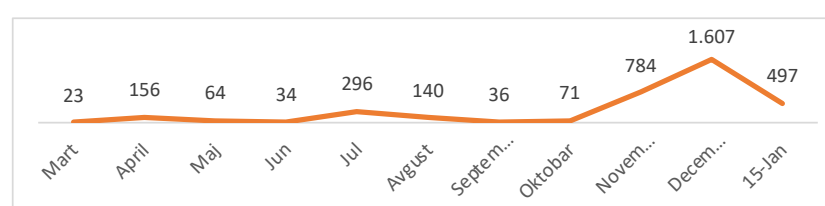


Slika 5. Broj obolelih od Kovida-19 tokom 2020.

Sa ciljem da se sagleda kako je pandemija koronavirusa uticala na tržište rada u posmatranom periodu, kreirane su analize na osnovu analitičkog modela prikazanog na slici 9. Jedna od prvih analiza pokazuje ukupan broj zaposlenih u stalnom radnom odnosu u dve uzastopne godine (slika 6).



Slika 6. Ukupan broj zaposlenih u stalnom radnom odnosu po mesecima u dve uzastopne godine



Slika 7. Broj preminulih od virusa COVID-19 tokom 2020.

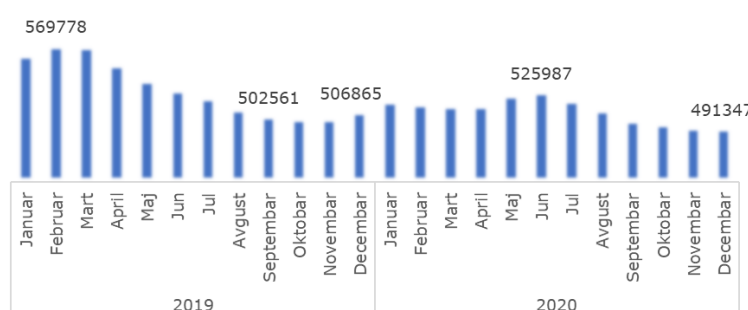
Na slici 7 prikazan je ukupan broj stalno zaposlenih po mesecima u dve uzastopne godine. Na osnovu dijagrama vidi se da je broj stalno zaposlenih u svim mesecima 2020. bio veći u odnosu na isti mesec 2019. godine. Na njemu možemo videti da su brojevi u 2019. godini uglavnom konstantni i iznose oko 2.000.000 zaposlenih, dok početkom 2020. godine, gledajući samo januar i februar, primećujemo rast broja stalno zaposlenih za 2,5%, odnosno 53.000 novozaposlenih. Blagi pad broja zaposlenih koji su u stalnom radnom odnosu postoji od februara do marta 2020. i on iznosi oko 5.000 zaposlenih ili 0,2%. Međutim, prekidom vanrednog stanja u maju 2020. godine, broj zaposlenih u stalnom radnom odnosu ponovo raste, za 4,5%, i do septembra ne dolazi do većih promena. Prema mesečnom biltenu Republičkog zavoda za statistiku za septembar 2020, u tom mesecu ukupna registrovana zaposlenost je veća za 2,5% (53.734 lica) u odnosu na septembar 2019. Kod pravnih lica je broj zaposlenih u stalnom radnom odnosu povećan za 54.161 lice, a kod preduzetnika je povećan za 10.796 lica.

Imajući u vidu da se pandemija nije negativno odrazila na zaposlene u stalnom radnom odnosu, cilj sledeće analize bio je da utvrdi kakav je uticaj pandemije na zaposlene po ugovoru. Na osnovu dobijenih podataka prikazanih na slici 8 vidi se da je od marta 2020, kada je proglašena pandemija koronavirusa u Srbiji, broj zaposlenih po ugovoru počeo da opada, i da je tokom karantina u aprilu 2020. bio najniži. Od maja meseca, kada je karantin ukinut, taj broj počeo je da raste i približio se broju zaposlenih po ugovoru kakav je bio u februaru 2020. Ovo upućuje na zaključak da je broj sezonskih radnika u 2020. u odnosu na 2019. godinu značajno opao. Gledano na mesečnom nivou, razlika je u proseku 9.000 zaposlenih, s tim da razlika u junu iznosi 10.000, dok su za preostala dva meseca ti brojevi nešto niži: jul – 8.000 i avgust – 9.000. Gledano u procentima, zabeležen je pad od 12% u odnosu na isti period prethodne godine. Na slici 18 prikazan je pregled broja zaposlenih po ugovoru u istom periodu. U ovu grupu zaposlenih spadaju svi sezonski radnici ili radnici zaposleni putem omladinske ili studentske zadruge. Na grafikonu primećujemo dosta oscilacija u zavisnosti od perioda godine. Kako bismo najbolje prikazali uticaj koronavirusa na ovu kategoriju zaposlenih, uzećemo sa grafikona podatke iz letnjeg perioda 2019. i istog perioda 2020. godine. Grafikon sa filtriranim podacima prikazan je na slici ispod (slika 8).



Slika 8. Zaposleni po ugovoru – od početka karantina

Na osnovu raspoloživih podataka urađena je i analiza ukupnog broj nezaposlenih u dve uzastopne godine (slika 9). Najveća nezaposlenost u 2019. zabeležena je februaru mesecu i iznosila je 569.778 prema zvaničnim podacima Republičkog zavoda za statistiku. Od februara do septembra taj broj je opao za 49.217 i u septembru je iznosio 502.561. Početkom 2020. godine, tačnije u januaru, broj nezaposlenih je naglo porastao za 9.643 u odnosu na decembar 2019. godine. Ponovni rast broja nezaposlenih zabeležen je u junu mesecu, nakon ukidanja karantina.



Slika 9. Ukupan broj nezaposlenih u dve uzastopne godine.

U 2020, najveći broj novoprijavljenih na tržište rada zabeležen je tokom juna meseca. Ovaj podatak ukazuje na to da je nakon ukidanja karantina u Srbiji početkom maja 2020. izvestan broj radnika ostao bez posla, što je dovelo do povećanja broja novoprijavljenih na tržište rada. Pad broja novoprijavljenih tokom marta i aprila objašnjava se time da su nezaposleni tokom vanrednog stanja u Srbiji mogli da se prijave Nacionalnoj službi za zapošljavanje samo elektronskim putem, tako da podaci nisu sasvim realni. Na slici 10 prikazan je prosečan broj zaposlenih po delatnostima, industrijama, odnosno sektorima privrede. Najveći broj zaposlenih i u 2020. i u 2019. godini u Srbiji radio je u prerađivačkoj industriji i trgovini na veliko i malo.

Prosečan broj zaposlenih po delatnostima		Godina		Indeks rasta
Delatnost		2019	2020	
Poslovanje nekretninama	6.667	7.000	↑	5,00%
Snabdevanje el. energijom, gasom i parom	26.000	24.889	↓	-4,27%
Rudarstvo	25.917	29.000	↑	11,90%
Poljoprivreda, šumarstvo i ribarstvo	30.917	30.000	↓	-2,96%
Snabdevanje vodom i upravljanje otpadnim vodama	35.583	35.556	↓	-0,08%
Umetnost, zabava i rekreacija	36.667	37.667	↑	2,73%
Ostale uslužne delatnosti	42.667	43.778	↑	2,60%
Finansije i delatnost osiguranja	43.833	44.000	↑	0,38%
Informisanje i komunikacije	67.583	72.667	↑	7,52%
Usluge smeštaja i ishrane	82.583	84.889	↑	2,79%
Administrativne i pomoćne uslužne del.	106.500	101.667	↓	-4,54%
Stručne, naučne, inovacione i tehničke del.	109.000	107.889	↓	-1,02%
Građevinarstvo	105.917	114.333	↑	7,95%
Saobraćaj i skladištenje	119.000	122.333	↑	2,80%
Obrazovanje	146.250	150.556	↑	2,94%
Zdravstvena i socijalna zaštita	156.917	154.667	↓	-1,43%
Državna uprava i obavezno soc. osiguranje	157.417	158.111	↑	0,44%
Trgovina na veliko i malo i popravka mot. voz.	342.500	345.222	↑	0,79%
Prerađivačka industrija	459.667	472.333	↑	2,76%
Ukupno	110.610	112.450		2%

Slika 10. Prosečan broj zaposlenih po delatnostima

Prema zvaničnim podacima, prosečan broj zaposlenih u 2020. veći je za 2% u odnosu na 2019. Najveći rast zabeležen je u sektoru rudarstva, u iznosu od 11.9%; oblasti informisanja i komunikacije: 7.52%, te poslovanju sa nekretninama: 5%. Pad zaposlenosti beleže delatnosti kao što su administrativne i pomoćne uslužne delatnosti: -4.54%, snabdevanje električnom energijom i gasom: -4.27% i druge.

5. Zaključak

Pandemija izazvana virusom COVID-19 negativno se odrazila na tržište rada širom sveta, ostavljajući veliki broj ljudi bez posla, a dosta njih je bilo primorano da radi skraćeno radno vreme, što je kasnije dovelo do smanjenja mesečnih primanja. U ovom radu prikazana je analiza tržišta rada u Srbiji u periodu pandemije virusa COVID-19, na osnovu javno dostupnih podataka Republičkog zavoda za statistiku. Analizom dostupnih podataka došlo se do sledećih zaključaka. Kada je reč o broju zaposlenih lica, posledice pandemije COVID-19 daleko više su osetila lica zaposlena po ugovoru, odnosno zaposleni van stalnog radnog odnosa. Generalno je broj zaposlenih po ugovoru od početka 2020. bio niži nego prethodne godine, a izbijanjem pandemije taj broj je dodatno opao. Samim tim što za vreme karantina nisu radili ugostiteljski objekti, hoteli i slično, broj potrebnih radnika se smanjio, a sa ukidanjem vandrednog stanja, taj broj se nije vratio na pređašnju vrednost. Ovome je takođe doprinelo i konstantno uvođenje i prekidanje epidemioloških mera koje se tiču ugostiteljskih objekata.

Što se tiče analize broja nezaposlenih lica na tržištu rada, primetili smo rast broja novoprijavljenih lica nakon ukidanja vandrednog stanja u maju 2020. godine, što znači da je veliki broj ljudi u vanrednim okolnostima dobio otkaz. Gledajući broj novoprijavljenih u periodu neposredno nakon ukidanja vandrednog stanja, možemo konstatovati da je taj broj porastao više nego duplo u odnosu na maj.

Drugačiju sliku o uticaju koronavirusa na tržište rada i gubitak posla daju istraživanja koja su sprovedena za vreme vanrednog stanja tokom aprila 2020 [11, 13]. Prema tim istraživanjima, 8% ispitanika koji su bili u radnom odnosu u februaru 2020. ostalo je bez posla; od toga, polovina je ostala bez posla zbog zatvaranja firmi, a petini je istekao ugovor. U većini ostalih slučajeva zaposleni su bili prinuđeni da daju otkaz zbog ukidanja javnog prevoza, zatvaranja škola i obdaništa, kao i obustava socijalnih usluga podrške za starije, pa tako nisu mogli da usklade odlaske na posao i brigu o članovima porodice. Takođe, svi koji su bili u potrazi za zaposlenjem bili su onemogućeni u tome s obzirom na izmenjeni režim rada u kompanijama širom zemlje.

Reference

1. Borjanović S, Heneberg DJ, Lindner R, Stojković Lj, Bordjoški M, Gligić A, et al. Investigation of the source of infection (index case) in smallpox 1. International Labour Organization. ILO Monitor: COVID-19 and the World of Work. Updated estimates and analysis. Int Labour Organ. [internet]. 2020, [citirano 2. 3. 2021]. Dostupno na: https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/briefingnote/wcms_740877.pdf
2. Svetska banka, Ekonomski i socijalni uticaj COVID-19. [internet]. 2020, [citirano 2. 3. 2021]. Dostupno na: <https://pubdocs.worldbank.org/en/168321591340102093/WBRER17-12-Private-Sector-BOS.pdf>
3. Privredna komora Srbije. Istraživanje „Zajedno kroz krizu“, uticaj COVID-19 krize na privredu i poslovanje – Faza II. Maj 2020. 43–44.
4. Fondacija Cenar za demokratiju. Uticaj epidemije COVID-19 na položaj i prava radnica i radnika u Srbiji. Beograd. 2020.
5. Nacionalna služba za zapošljavanje. Mesečni statistički bilten. [internet]. 2020. Mart; 24. [citirano 5. 3. 2021]. Dostupno na: http://www.nsz.gov.rs/live/dokumenti/statisti_ki_bilteni_nsz_-_2020._godina.cid63336
6. Nacionalna služba za zapošljavanje. Mesečni statistički bilten. [internet]. 2020. April; 24. [citirano 5. 3. 2021]. Dostupno na: http://www.nsz.gov.rs/live/dokumenti/statisti_ki_bilteni_nsz_-_2020._godina.cid63336
7. Employment Outlook 2020. OECD. [internet]. 2020. [citirano 5. 3. 2021]. Dostupno na: <http://www.oecd.org/employment-outlook/2020/>
8. Lee S, Schmidt-Klau D, Verick S. The labour market impacts of the COVID-19: A global perspective. The Indian Journal of Labour Economics. 2020 Oct;63(1):11–5.
9. Boshkoska M, Jankulovski N. Coronavirus Impact on Global Economy. Annals of the „Constantin Brâncuși” University of Târgu Jiu, Economy Series., 2020;4:18–23.
10. Worldometer. [internet]. 2021. [citirano 12. 3. 2021]. Dostupno na: <https://www.worldometers.info/coronavirus/>
11. Istraživanje USAID-a: Uticaj koronavirusa i rast e-trgovine obeležili prethodnih godinu dana. [internet]. 2020. [citirano 3. 3. 2021]. Dostupno na: <https://www.usaid.gov/sr/serbia/news-information/press-releases/usaid-business-sector-survey-shows-impact-covid-and-increase>
12. Republički zavod za statistiku. Mesečni statistički bilten. Septembar 2020. [internet]. 2020. [citirano 5. 3. 2021]. Dostupno na: <https://www.stat.gov.rs/sr-latn/calendar/>
13. SeConS. Istraživanje o efektima pandemije i vanrednog stanja na zaposlenost, uslove rada i brigu o domaćinstvu. [internet]. 2021. [citirano 14. 3. 2021]. Dostupno na: <https://www.secons.net/article.php?a=131https://data.stat.gov.rs/>
14. Pratt MK, Fruhlinger J. What is business intelligence? Transforming data into business insights. Retrieved March. 2019;23:2020.
15. Get the Competitive Edge With The Latest Database Trends For 2020. [internet]. 2020. [citirano 14. 3. 2021]. Dostupno na: <https://penmypaper.com/blog/latest-database-trends-for-2020/>
16. Graovac J, Skripta iz predmeta Projektovanje baza podataka. [internet]. 2016. [citirano 14. 3. 2021]. Dostupno na: http://poincare.matf.bg.ac.rs/~jgraovac/courses/projbp/2016_2017/projbp_skripta.pdf
17. Corporate Finance Institute. What is a Decision Support System (DSS)? [internet]. 2020. [citirano: 15. 3. 2021]. Dostupno na: <https://corporatefinanceinstitute.com/resources/knowledge/other/decision-support-system-dss/>
18. MPercept Academy. Business Intelligence: The Leap You Need. [internet]. 2018. [citirano: 16. 3. 2021]. Dostupno na: <https://medium.com/@mperceptacademy/business-intelligence-the-leap-you-need-58b2742fd186>
19. Kostić M, skladišta podataka i OLAP tehnologija. [internet]. 2018. [citirano 4. 3. 2021]. Dostupno na: http://poincare.matf.bg.ac.rs/~vlada/Courses/Matf%20MNSR/Prezentacije%20Individualne/Kostic_Skladiste_podataka_i_OLAP_tehnologija.pdf
20. Veljović A, Njeguš A, Osnove relacionih i analitičkih baza podataka. [internet]. 2004. [citirano 10. 3. 2021]. Dostupno na: <http://www.ftn.kg.ac.rs/konferencije/rppo13/Monografije/osnoverelacionihianalitickihbp.pdf>



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Developing an analytical database for the purpose of analyzing the impact of the COVID-19 pandemic on the labor market in Serbia

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Abstract: The COVID-19 pandemic has had a negative impact on economic growth rate and endangered many jobs. To consider the effects of the coronavirus pandemic in Serbia, the process of developing an analytical database is presented in this paper. Publicly available data from the Statistical Office of the Republic of Serbia were used in the analysis stage. The paper comprises three chapters. Chapter 1 discusses the impact of the pandemic on the global, and Serbian national economy. Chapter 2 provides theoretical assumptions referring to decision support systems and business intelligence. Chapter 3 presents the development of an analytical database for the purpose of analyzing the impact of the COVID-19 pandemic on the labor market in Serbia. This chapter also describes the process of data collection and transformation, as well as feeding the data into the analytical database, as well as data analyses that illustrate the impact of the coronavirus pandemic on the labor market in Serbia. Microsoft Excel and Microsoft Power BI software was used for the development and implementation of an analytical data model. Preparation of data for feeding it into the analytical database was performed

in Microsoft Excel, whereas Microsoft Power BI was used for the analytical part.

Keywords: analytical data model, COVID-19 pandemic, labor market, unemployment, industries

1. Introduction

The COVID-19 pandemic has led to a great decline in economic activity around the world and caused an economic crisis that affected all business segments. The industries most threatened by the pandemic are also those that employ the most workers, such as tourism and hospitality industry, transport, and many others.

The projection of the Organization for Economic Cooperation and Development (OECD) shows that the unemployment rate will be much higher than at the peak of the global economic crisis of 2008. Based on publicly available data, the most vulnerable groups are unskilled workers, younger population, and women. To avoid collapse in the moments when the global economy was at a complete standstill, many companies were forced to switch to the home office model, and perform many of their tasks online. To prevent the spreading of the virus, and preserve the health of their populations, many countries resorted to radical measures. Borders were closed, mobility was restricted, even curfews were introduced at certain periods; in some countries, the curfew is still in force. All this has forced companies to close down particular sectors, and consequently, to a large number of layoffs, salary cuts, and overall drop in production and availability of services. The crisis has not only affected large companies which closed temporarily, or operated at a minimum capacity, but smaller ones as well. At the end of the first trimester of 2020, when it was believed that the pandemic was in full swing, the whole country closed down, and everything stopped. Serbian industry operated at a minimum capacity, most international companies sent their employees to work from home, whereas production facilities were closed down completely. National governments had to find a way to save their industries, and thus the global economy, so in agreement with the companies, they paid financial aid for all employees in the public and private sector. That way, they managed to save a large number of jobs, and prevent a complete economic collapse.

2. Impact of the coronavirus pandemic on the global economy

Since the beginning of last year, the world economy has been facing the greatest challenge since the global crisis of 2008. It is predicted that the spread of the virus this year will seriously affect the economy and job security, although these consequences were felt in the previous year as well, in all segments. Industries that have been hit the hardest by the pandemic include global financial markets, air traffic, transport, industrial production, sales, investments, hospitality industry, etc. [1]

IMF Director Kristalina Georgieva stated that the economic growth would be lower by 0,5% in regard to the predicted 3,3% in 2020 (Figure 1). S&P estimates are even more dire. Namely, their predictions state that economic growth will fall to miniscule 0,4% compared to the expected 3.3%, which is the slowest recorded growth ever since the economic crisis of 1982. S&P believe that the measures adopted to combat the virus have pushed the global economy into recession [6].

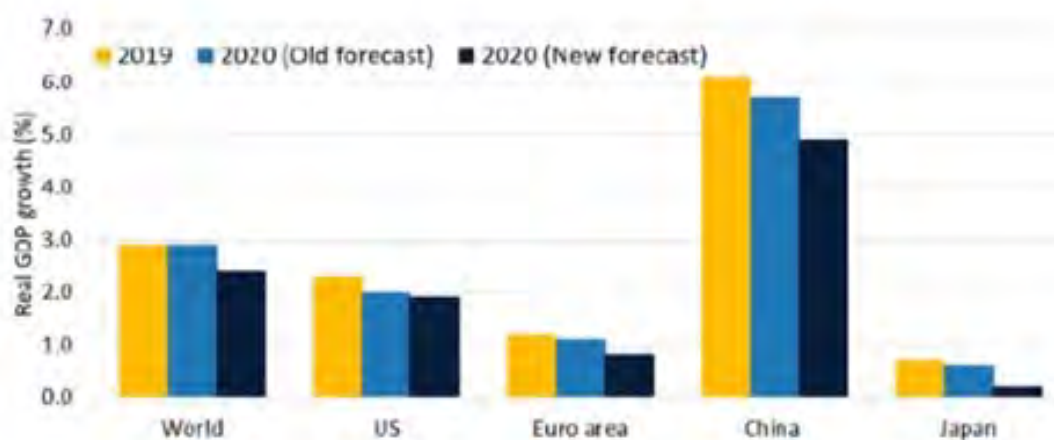


Figure 1. Global economic growth rate [8]

Another organization that has spoken about the new estimates of economic development rates for 2020 is OECD – Organization for Economic Cooperation and Development. The graph above shows their estimates. As we can see, OECD estimates say that the Chinese economy will only grow by 4,9% in regard to the previous estimate of 5,7%. The feature that characterizes the current crisis is that it is the first crisis in history that has managed to make things worse on a global level in such a short time. The crisis caused by the COVID-19 pandemic will hit the global economy hard, and the consequences will be felt by everyone, whether directly, or indirectly.

This epidemic has caused such severe economic consequences partly because of the drastic measures that countries around the world have taken to prevent the spread of the virus. For example, one of the more restrictive measures implemented by China was to close down companies across the country. This measure greatly affected economic activity on a global level, because a large portion of global production is dependent on importing parts from China.

The French Minister of Economy Bruno Le Maire believes that the epidemic is an event that will completely change the current development. The outbreak of the virus and its consequences have revealed the unreasonable dependence of the whole world on China. Many sectors have long depended on Chinese raw materials or products. For example, 95% of the supply of electric batteries and 80% of raw materials in the healthcare industry originate from China or Asia [8].

Another industry that has been hit particularly hard by the aforementioned measures is the automotive industry. Specifically, according to research conducted by He and Zill, the impact of stopping production facilities in China has spread as a domino effect to the rest of the world. Due to the imposed measures, China reduced car sales in the country by a staggering 92%. The Tesla company postponed the production of their new model 3, while Volkswagen had to postpone production in all their Chinese plants, which are partnered with SAIC Motors. In February 2020, the South Korean Hyundai became the first major car manufacturer to temporarily shut down production due to the lack of parts; on April 7, Nissan Motors announced that they had laid off 10,000 workers in the USA; Honda announced that half of their workers in America would go on temporary leave. The consequences are also being felt in the Japanese market. According to the Japan Automobile Manufacturers Association, the Japanese new-vehicle market has dropped by 9,2%. The European automobile market has not been spared either. Interruptions in production have hit the employees in Germany the hardest, followed by France, Italy and Spain. According to the research of the European Automobile Manufacturers Association (ACEA) on the impact of the crisis on the European automotive industry, which covered the countries of the EU and the UK, about 1,200,000 jobs in car production alone have been hit by factory shutdowns, and these temporary shutdowns have also led to the loss of 2,400,000 motor vehicles. Despite the gradual lifting of the restrictions regarding the pandemic and re-opening of certain factories across the EU, it will take a long time for the automotive industry to return to normal functioning. Like the automotive industry, all other branches of the global economy must expand their network of suppliers and must not allow themselves to be entirely dependent on a single country or a region [8].

The coronavirus pandemic caused a global health crisis that soon developed into a global economic crisis, which eventually led to a labor market crisis. As the pandemic continued to spread, and the predictions of the health organizations became more pessimistic, any assessment of the situation in the labor market has become uncertain, rendering any projections about ways to develop business impossible.

In such situations, we can only rely on the data from the great economic crisis of 2008–2009. The employment recovery back then was even slower and more painful, which hindered economic development and growth of productivity in the long run. It took more than a decade for the unemployment rate to return to the pre-crisis level, where the younger population has never fully recovered. It could be argued that economy and employment have separated from each other, so while labor productivity continues to grow, salaries and labor incomes have fallen behind. As a result, we have inequality that continues to grow. The conclusion that arose is that the previously widely-accepted “trickle-down economics”, i.e. the principle “Don’t let it pour, let it trickle”, was a great failure, and that such mistakes must not be repeated in the current labor market crisis [8].

According to some data [6], it is estimated that the current number of employed is 3,3 billion, whereby 2 billion work in the informal, or the “gray” economy, i.e. approximately 62%. It is estimated that 1,6 billion among these 2 billion will be greatly affected by the crisis, due to lockdown measures or work in high-risk sectors.

A large number of young people are affected by the current situation. Unemployment has hit 67,6 million of young people around the world, which is equivalent to 13,7% of the total youth workforce. A much greater percent of the youth workforce did not even have a job when the pandemic broke out, and more than three quarters worked in the informal economy which makes them even more vulnerable in these situations [6].

Therefore, it can be concluded that the crisis caused by the coronavirus affects young people in three ways:

- » interruptions in education, training and work-based learning;
- » greater difficulties for new entrants into the labor market;
- » loss of employment and income.

At the beginning of the crisis, 178 million young people were employed in the sectors, such as accommodation, food and catering, and retail. Measures to combat the virus have led to a reduction in the working hours, lay-offs and a major loss of income, according to the global survey conducted by ILO - International Labor Organization, not to mention 30 million that have lost their jobs since the outbreak of the pandemic [7].

The pandemic has also revealed a great gender inequality in the labor market in pandemic conditions. Although there has been some progress over the past decades, gender disparities have been significant in the labor markets around the world even before the crisis. They include differences in gender participation in the workforce, income and employment quality. And now, the crisis caused by COVID-19 disproportionately affects women in the business world in the following four ways [7]:

- » Almost 510 million, or 40% of women around the world work in the sectors that have been hit the hardest (as opposed to 36,6% men);
- » 55 million, or 73,2% of employed registered as domestic workers are at risk of losing their job and income due to blockades and lack of social security coverage;
- » Women make up more than 70% of healthcare and social workers. Although they are a majority in the sectors most exposed to the virus, many of them are in unskilled or low-paid positions;
- » Finally, the closing of education centers, care services and schools, as well as the need to support older relatives have additionally exacerbated inequality.

According to a report by the International Labor Organization [1], the crisis sparked by the coronavirus pandemic has caused the greatest decline in accommodation and food services, manufacturing, trade, real estate, administration and business, as well as other business activities and services, thus putting 38% of the workforce at risk. In 2019, there were 1,297,400 employees in these sectors in Serbia (47,5% of the total number of employed), whereas sectors for which the decline was estimated as moderately high employed 201,400 people.

According to the report of the World Bank [2], and starting from the number of employees by sector, it is predicted that the impact of the coronavirus in Serbia will be most keenly felt in the production of durable goods, because 19% of the workforce in Serbia is employed in the manufacturing industry. According to the same report, manufacturers-exporters employ the largest number of workers compared to other sectors that might be affected by the crisis. Due to a decline in exports and increasingly complex imports of raw materials during the pandemic, the demand for durable goods drops in times of great crisis.

The service sector is one of the most affected sectors in the world. Serbia is no exception, because the service sectors and small businesses have been hit the hardest by the crisis. According to a survey conducted by the Chamber of Commerce of Serbia and USAID (Figure 2), 22% of the respondents temporarily suspended their business, while 26,6% partially suspended their business activity. Of the total number of respondents, half stated that their income in March 2020 dropped by more than 50% compared to 2019, whereas one third experienced a drop of income of 80% [2].

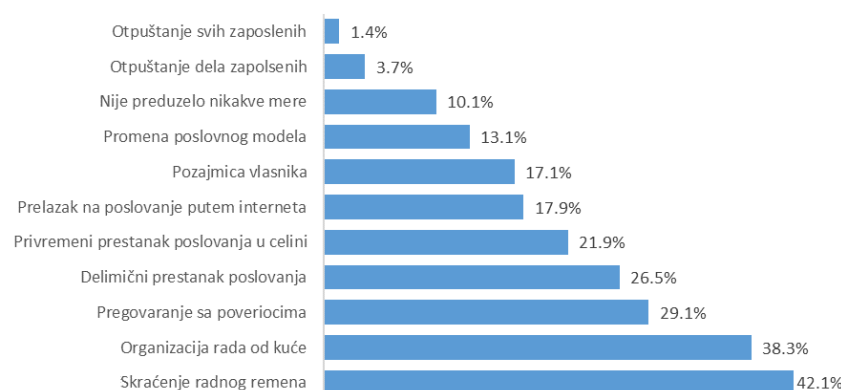


Figure 2. Steps taken by businesses in Serbia due to reduced business activity caused by COVID-19 pandemic in % [1]

According to the same survey, about 35% of self-employed entrepreneurs and micro enterprises expressed concern over the 80% drop in income compared to 2019; about 7% of medium-sized enterprises and 15% of large companies stated that they expected a drop in revenue on the same scale. Although a significant number of respondents keenly felt the consequences of the pandemic, only 5,1% of the respondents stated that they laid off all, or part of the workers (Figure 2). Of that number, 13,2% were companies in the sector of tourism and hospitality, 10,1% were expert, scientific, innovative, technical and administrative companies, 7,5% were from the sector of trade, and 7,7% from the construction industry [3].

The drop in the number of employees arose as a consequence of the reduced volume of business. The greatest decline in the volume of business was recorded in the sector of trade and hospitality (94,9%), followed by a 65,6% drop in trade. Food and drink companies experienced a 64% drop. There was also a drastic decline in the volume of business in 83,6% of companies in the creative industry, 44,8% in expert, scientific, innovative and technical activities, as well as 36,4% in the IT sector [4]. According to the data of the Serbian National Employment Service, the recorded decline in labor market demand in April and March can lead to increased unemployment [5].

In order to analyze the impact of the coronavirus pandemic on the labor market in Serbia, the following chapters will present the theoretical foundations of analytical and relational databases, and describe the process of building an analytical database for the purposes of this paper.

3. Business decision support systems and business intelligence (BI)

3. A decision support system (DSS) is an information system that aids a business in decision-making

Activities that require judgment, determination, and a sequence of actions [18]. The purpose of a decision support system is to create detailed informative reports by collecting and analyzing data, which distinguishes them from common operational applications used for data collection, but not data analysis. Decision support systems are highly applicable in all sectors of a company. One of their main applications in the organization is real-time reporting. This is best seen when planning inventory and managing

stock minute by minute. In such an inventory system, the organization demands data on the stock level in real time so that they could be replenished “just in time”, thus preventing delays in production, and avoiding the so-called domino effect [16].

Decision support systems (DSS) and business intelligence (BI) often go hand-in-hand. Experts consider BI the successor of DSS, since DSS systems are known to be one of the integral elements of business intelligence systems, together with data mining [19, 20, 21]. While BI covers a broad category of applications, services and technologies for collecting, mining, analyzing and accessing decision-making data [22], DSS applications are more specialized, and designed to support certain decisions. For example a business DSS can help the company project revenue over a period of time by analyzing data on the past sales and current variables [19].

DSS comprises three main components [19] (Figure 3):

- » Model Management System – this component stores models that can be used in decision-making. The models are used in decision-making when forecasting demand for a good or service. Models can be classified according to application:
 - » Statistical models – These models are used to establish relationships between the occurrences of an event and various factors related to that event. For example, they are used to analyze changes in the market by category.
 - » Sensitivity analysis models – Used to provide answers to what-if situations in the organization, i.e. they are used for analyses that predict the end result of an activity/process.
 - » Optimization analysis models – Used to find optimum value.
 - » Forecasting models – Include regression models, time series analysis, and other models for business plan analysis.
- » User Interface – component that includes tools that help the end-user of a DSS to navigate through the system.
- » Knowledge Base – includes information from internal sources (information collected in a transaction process) and external sources (online databases) [16].

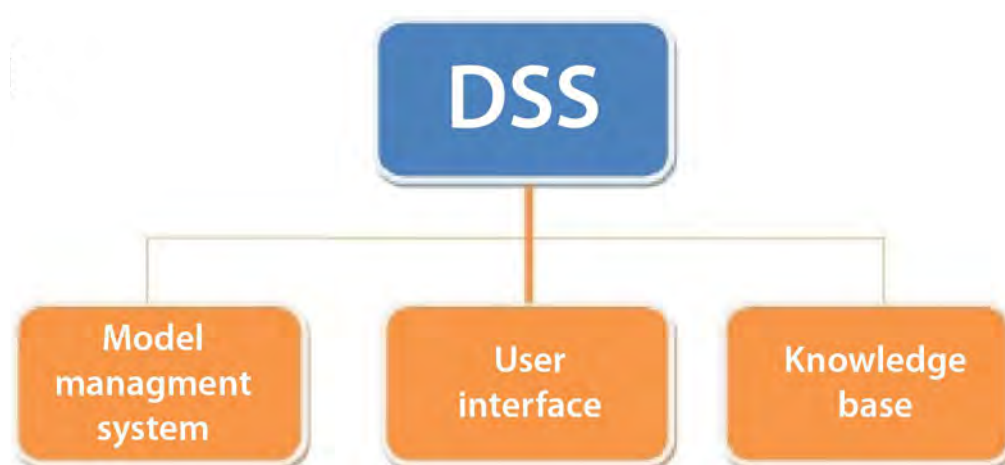


Figure 3. The main components of the decision support system

Decision support systems have their advantages and disadvantages. Advantages of DSS are:

- » A decision support system increases the speed and efficiency of decision-making activities. It is possible, as a DSS can collect and analyze real-time data.
- » It promotes training within the organization, as specific skills must be developed to implement and run a DSS within an organization.
- » It automates monotonous managerial processes, which means more of the manager’s time can be spent on decision-making.
- » It improves interpersonal communication within the organization.

Disadvantages of DSS are:

- » The cost to develop and implement a DSS is a huge capital investment, which makes it less accessible to smaller organizations.
- » A company can develop a dependence on a DSS, as it is integrated into daily decision-making processes to improve efficiency and speed. However, managers tend to rely on the system too much, which takes away the subjectivity aspect of decision-making.
- » A DSS may lead to information overload because an information system tends to consider all aspects of a problem. It creates a dilemma for end-users, as they are left with multiple choices.
- » Implementation of a DSS can cause fear and backlash from lower-level employees. Many of them are not comfortable with new technology and are afraid of losing their jobs to technology [16].

On the other hand, business intelligence (BI) is a combination of processes, architecture and technology for transforming collected data into useful information for the end-user [20]. This term from the field of business analytics often refers to a range of tools that provide quick and easy insight into the current state of the company as an organization based on available data [17]. Business intelligence is descriptive and tells us what is happening now, as well as what has happened in the past that led to the current state. In the past, business intelligence systems could only be used by information technology experts, however, as BI tools have become more intuitive and easier to use, they can now be used by a large number of users from various organizational domains. There are two types of business intelligence – traditional BI in which IT experts use internal transactional data to create reports, and modern BI in which business users use intuitive systems to analyze data much faster than before.

Organizations still mostly opt for traditional BI for certain types of report. For example, periodic financial statements, since data sets are mostly standardized and predictable. When it comes to modern BI, organizations use this type when real-time insight is needed, as it is constantly changing. The reason is the speed of response needed to obtain as accurate results as possible.

There are business intelligence techniques that can be used by companies to obtain useful data that will be later used in decision-making.

The following BI techniques are the most common:

- » Analytics – This technique involves the study of available data to gain insight into market trends and conditions. Companies use analytics to make sense of the data they possess and make better business decisions based on them.
- » Predictive modeling is a technique that utilizes statistical parameters to create models that could be used in forecasting probabilities and trends. With predictive modeling, it is possible to predict the value for a particular data item as well as the attributes.
- » OLAP, or online analytical processing is a technique for solving analytical problems with different dimensions. The most important value in OLAP is its multidimensional aspect that lets users identify problems from different perspectives. OLAP could be used to complete tasks such as client management, budgeting, financial forecasting, etc.
- » Data mining is a technique for discovering patterns in huge datasets and often incorporates database systems, statistics, and machine learning to find these patterns. Data mining is an integral process for data management as well as the pre-processing of data since it ensures appropriate data structuring.
- » Model visualization – this technique is used to transform the discovered facts into histograms, plots, charts and other visuals that aid [17].

BI tools are all about helping you better understand data, because understanding data correctly helps one make better business decisions. Here's a rundown of a few popular business intelligence tools.

- » SISENSE – this software, i.e. BI tool is very user-friendly and allows everyone within an organization to manage, analyze and visualize complex datasets without involving the IT department. Since this tool uses in-chip technology, data processing is faster compared to other BI tools.
- » SAP Business Intelligence provides an array of advanced analytics solutions including machine learning, BI predictive analytics, and planning and analysis. This enterprise-level applications for client/server systems offers data visualization and analytics applications, reporting and analysis, mobile analytics and office integration. SAP is intended for higher company sectors.
- » Dundas BI is a BI tool that allows users to connect to multiple data sources in real-time. It provides great visualizations in tables, charts and charts that could be customized and viewed from mobile devices and desktops.
- » Power BI – this tool provides cloud-based BI services. In combination with the Power BI Desktop application, Power BI Services offer the possibility of storing and linking data from different sources, in addition to data analyzing and processing. The key components of this tool, in addition to the above, include Power BI Mobile Apps, Power BI Gateway, Power BI Embedded, Power BI Report Server and Power BI Visuals Marketplace. [17]

For the purpose of analyzing the impact of the coronavirus pandemic on the labor market in Serbia, Power BI and Microsoft Excel tools were used in the paper, as described in the next chapter.

4. Developing an analytical database

4.1 Collecting data to analyze the impact of COVID-19 on the labor market

For the purpose of analyzing the impact of coronavirus on the labor market in Serbia, data available on the official website of the Statistical Office of the Republic of Serbia, as well as websites that cover data about the number of new cases and deaths from COVID-19 were used [9, 10, 14]. Monthly statistical bulletins containing data on the number of employed persons per month, as well as records on the number of unemployed were downloaded from the website of the Statistical Office of the Republic of Serbia [5, 12]. The analysis of the impact of the COVID-19 pandemic on the labor market in Serbia was done for the period between January 2019 and September 2020.

The most important step in the development of an analytical model is the preparation process, and data transformation for further analysis. Accordingly, available data was fed into MS Excel, transformed using the Power Query tool, and finally prepared for loading into MS Power BI software. All dimension and fact tables were created in this way. Each table was assigned an adequate name in line with its content.

4.2 Developing an analytical data model

In order to consider the impact of the COVID-19 pandemic on the labor market in Serbia, an analytical data model was created. Due to the structure of input data, two fact tables were created for the purpose of analyzing the impact of the pandemic on the labor market in Serbia, one for analysis by activity (EmployeeByActivity), and the other for analysis by employment status (StatusEmployee) (Figure 4). In addition, based on available data, the following dimension tables were also created: Employer type, Business activity name, and Date table. Figure 4 shows the analytical data model created in the Power BI software, which was the basis for further analysis.



Figure 4. Analytical model

4.3 Analysis of the impact of the COVID-19 pandemic on the labor market in Serbia

Based on the analytical data model and publicly available data, the analysis of the impact of the coronavirus pandemic on the labor market in Serbia was conducted. The analysis covers the period between March and September 2019 and 2020. The reason for this is the fact that the pandemic was declared in Serbia in March 2020, and a state of emergency was declared in April. After the measures were relaxed, the number of new cases and deaths had begun to rise rapidly, so that, according to official data, the record in both categories was reached in July 2020 (Figure 5).

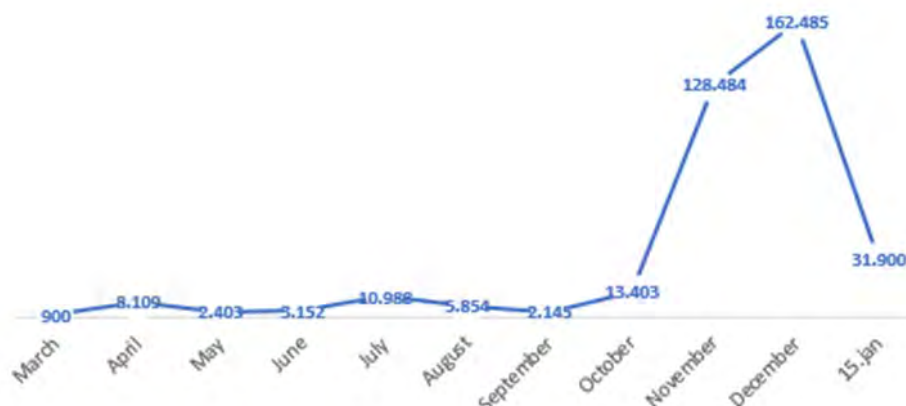


Figure 5. Number of confirmed cases of COVID-19 in 2020

In order to see how the coronavirus pandemic affected the labor market in the observed period, analyses based on the analytical model shown in figure 9 were created. One of the first analyses shows the total number of full-time employees in two consecutive years (Figure 6).



Figure 6. Total number of full-time employees by month over two consecutive years

In order to see how the coronavirus pandemic affected the labor market in the observed period, analyses based on the analytical model shown in figure 9 were created. One of the first analyses shows the total number of full-time employees in two consecutive years (Figure 7).

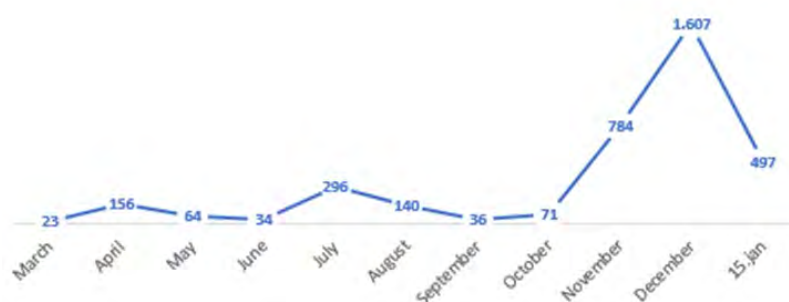


Figure 7. Number of deaths due to COVID-19 in 2020

Figure 7 shows the total number of full-time employees by month over the period of two consecutive years. Based on the diagram, it is clear that the number of full-time employees was higher in all months of 2020 compared to the same month of 2019. What is also visible is that the figures for 2019 are mostly stable – about 2,000,000 employed people, whereas if we look at January and February of 2020, there is a noticeable growth of full-time employment by 2,5%, i.e. 53,000 new employees. A slight drop in the number of full-time employees occurs in February and March 2020 and it equals 0,2%, or 5,000 people. However, with the lifting of the state of emergency in May 2020, the number of full-time employees begins to grow again by 4,5%, and there are no major changes until September. According to the monthly bulletin of the Statistical Office of the Republic of Serbia for September 2020, the total recorded employment for that month is higher by 2,5% (53,734 new employees) compared to September 2019. The number of full-time employees in legal entities increased by 54,161 new employees, whereas the number of new employees in enterprises was 10,796.

Bearing in mind that the pandemic did not have a negative impact on full-time employees, the aim of the next analysis was to determine the impact of the pandemic on temporary employees. Based on the obtained data shown in Figure 8, the number of temporary employees began to decline from March 2020, when the coronavirus pandemic was officially declared, reaching its lowest point in April 2020, during the lockdown. Starting in May 2020 when the lockdown was lifted, the number of temporary employees began to increase, approximately reaching the level of February 2020. This suggests that the number of seasonal employers/workers in 2020 had decreased significantly compared to 2019. If viewed on a monthly level, the average difference is 9,000 employees, the biggest difference being in June – 10,000 employees, and somewhat lower for the remaining two months July – 8,000 and August – 9,000. In percentage terms, there is a 12% decline with regard to the same period last year. Figure 9 shows the overview of the number of temporary employees in the same period. This includes all seasonal workers and people employed through youth and student cooperatives. The chart shows significant oscillations depending on the time of the year. In order to best illustrate the impact of the coronavirus pandemic on this employee category, we will compare data for summer 2019 and the same period in 2020. The chart with filtered data is shown in the figure below (Figure 8).



Figure 8. Temporary employees – from the beginning of lockdown

Based on available data, the analysis of the total number of unemployed people over two consecutive years was conducted (Figure 9). Record unemployment in 2019 was recorded in February – 569,778 according to the official data of the Statistical Office of the Republic of Serbia. In the period between February and September, the number of unemployed declined by 49,217 and was 502,561 people in September. In early 2020, i.e. more specifically in January, the number of unemployed increased sharply by 9,643 compared to December 2019. The number of unemployed increased again in June, after the lockdown had been lifted.

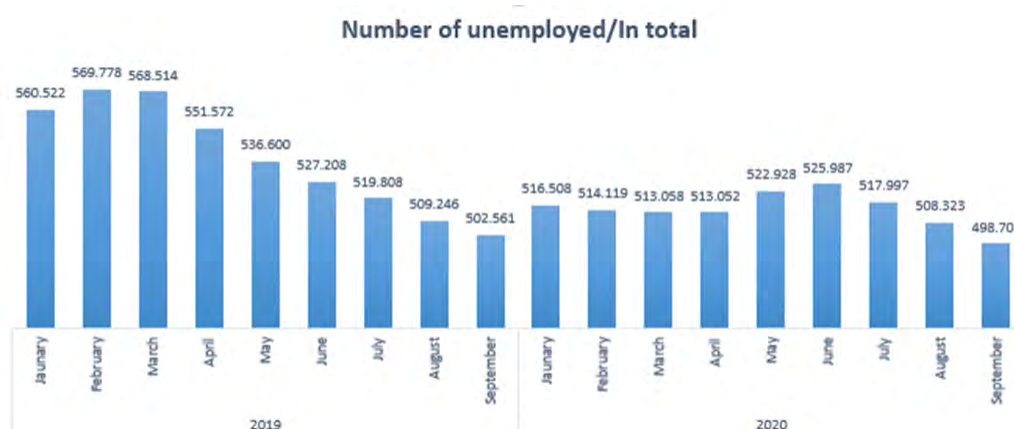


Figure 9. Total number of unemployed over two consecutive years

In 2020, the largest number of new entrants into the labor market was recorded in June. This indicates that with the lifting of the lockdown in May 2020, a certain number of employees in Serbia lost their jobs, which caused the increased number of new entrants into the labor market. The drop in the number of newly registered unemployed in March and April can be explained by the fact that unemployed individuals could only register to the National Employment Service online during the state of emergency, so these data are not quite accurate. Figure 10 shows the average number of employees by business activity, industry, i.e. economic sector. The majority of employees in Serbia in 2019 and 2020 worked in manufacturing and wholesale and retail.

Average number of employees by activity		Year		Growth index	
Activity		2019	2020		
Real estate		6.667	7.000	↑	5,00%
Electricity, gas and steam supply		26.000	24.889	↓	-4,27%
Mining		25.917	29.000	↑	11,90%
Agriculture, forestry and fishing		30.917	30.000	↓	-2,96%
Water supply and waste water management		35.583	35.556	↓	-0,08%
Art, entertainment and recreation		36.667	37.667	↑	2,73%
Other services		42.667	43.778	↑	2,60%
Finance and insurance		43.833	44.000	↑	0,38%
Information and communication		67.583	72.667	↑	7,52%
Hospitality industry		82.583	84.889	↑	2,79%
Administrative and support services		106.500	101.667	↓	-4,54%
Expert, scientific, innovative and technical industry		109.000	107.889	↓	-1,02%
Construction		105.917	114.333	↑	7,95%
Transport and storage		119.000	122.333	↑	2,80%
Education		146.250	150.556	↑	2,94%
Healthcare and social care		156.917	154.667	↓	-1,43%
Public administration and compulsory social security		157.417	158.111	↑	0,44%
Wholesale and retail, motor vehicle repair		342.500	345.222	↑	0,79%
Manufacturing		459.667	472.333	↑	2,76%
Total		110.610	112.450		2%

Figure 10. Average number of employees by business activity

According to official data, the average number of employed people in 2020 is 2% higher than in 2019. The highest growth was recorded in the mining industry – 11,9%; information and communication – 7,52%, and real estate – 5%. The decline of employment was recorded in the following sectors: administrative and support services – 4,54%, gas and electricity suppliers – 4,27%, etc.

5. Conclusion

The pandemic caused by the COVID-19 virus has had a negative impact on the labor markets around the world, leaving many people jobless, whereas others had to work part-time, which has caused a drop in their monthly income. This paper presents an analysis of the labor market in Serbia during the COVID-19 pandemic, based on publicly available data of the Statistical Office of the Republic of Serbia. The analysis of publicly available data yielded the following conclusions. When it comes to the number of employees, the consequences of the coronavirus pandemic were more keenly felt by temporary employees, i.e. those with fixed-term employment contracts. In general, the number of temporary employees was lower from the beginning of 2020 than in the previous year, and the outbreak of the pandemic caused that number to drop even further. Due to the fact that hospitality facilities were closed during the lockdown, the number of workers decreased, and did not return to the pre-pandemic level even after the lifting of the state of emergency. The constant introduction and withdrawal of epidemiological measures also negatively impacted the number of employees in the hospitality industry.

When it comes to the analysis of the number of unemployed on the labor market, it is noticeable that the number of newly registered unemployed increased after the state of the emergency was lifted in May 2020, which means that many people were laid off in these emergency circumstances. Observing the number of new entrants into the labor market after the abolition of the state of emergency, we can conclude that this number had more than doubled compared to May.

Research conducted during the state of emergency in April 2020 gives a different picture of the impact of coronavirus on the labor market and loss of employment [11, 13]. According to this research, 8% of respondents who were employed in February 2020 lost their jobs; half of them lost their jobs because their companies closed down, and one fifth were let go because their contracts had expired. In most other cases, employees were forced to resign because public transport services were canceled, schools and kindergartens were closed, and social care for the elderly was suspended, so they could not reconcile work and care for their family members. In addition, all those who sought employment in this period were prevented from doing so due to the changed work model companies around the country had to adopt.

References

1. International Labour Organization. ILO Monitor: COVID-19 and the World of Work. Updated estimates and analysis. Int Labour Organ. [internet]. 2020, [citirano 2. 3. 2021]. Dostupno na: https://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/documents/briefingnote/wcms_740877.pdf
2. Svetska banka, Ekonomski i socijalni uticaj COVID-19. [internet]. 2020, [citirano 2. 3. 2021]. Dostupno na: <https://pubdocs.worldbank.org/en/168321591340102093/WBRER17-12-Private-Sector-BOS.pdf>
3. Privredna komora Srbije. Istraživanje „Zajedno kroz krizu“, uticaj COVID-19 krize na privredu i poslovanje – Faza II. Maj 2020. 43–44.
4. Fondacija Cenar za demokratiju. Uticaj epidemije COVID-19 na položaj i prava radnica i radnika u Srbiji. Beograd. 2020.
5. Nacionalna služba za zapošljavanje. Mesečni statistički bilten. [internet]. 2020. Mart; 24. [citirano 5. 3. 2021]. Dostupno na: http://www.nsz.gov.rs/live/dokumenti/statisti_ki_bilteni_nsz_-_2020._godina.cid63336
6. Nacionalna služba za zapošljavanje. Mesečni statistički bilten. [internet]. 2020. April; 24. [citirano 5. 3. 2021]. Dostupno na: http://www.nsz.gov.rs/live/dokumenti/statisti_ki_bilteni_nsz_-_2020._godina.cid63336
7. Employment Outlook 2020. OECD. [internet]. 2020. [citirano 5. 3. 2021]. Dostupno na: <http://www.oecd.org/employment-outlook/2020/>
8. Lee S, Schmidt-Klau D, Verick S. The labour market impacts of the COVID-19: A global perspective. The Indian Journal of Labour Economics. 2020 Oct;63(1):11–5.
9. Boshkoska M, Jankulovski N. Coronavirus Impact on Global Economy. Annals of the „Constantin Brâncuși” University of Târgu Jiu, Economy Series., 2020;4:18–23.
10. Worldometer. [internet]. 2021. [citirano 12. 3. 2021]. Dostupno na: <https://www.worldometers.info/coronavirus/>
11. Istraživanje USAID-a: Uticaj koronavirusa i rast e-trgovine obeležili prethodnih godinu dana. [internet]. 2020. [citirano 3. 3. 2021]. Dostupno na: <https://www.usaid.gov/sr/serbia/news-information/press-releases/usaid-business-sector-survey-shows-impact-covid-and-increase>
12. Republički zavod za statistiku. Mesečni statistički bilten. Septembar 2020. [internet]. 2020. [citirano 5. 3. 2021]. Dostupno na: <https://www.stat.gov.rs/sr-latn/calendar/>
13. SeConS. Istraživanje o efektima pandemije i vanrednog stanja na zaposlenost, uslove rada i brigu o domaćinstvu. [internet]. 2021. [citirano 14. 3. 2021]. Dostupno na: <https://www.secons.net/article.php?a=131https://data.stat.gov.rs/>
14. Pratt MK, Fruhlinger J. What is business intelligence? Transforming data into business insights. Retrieved March. 2019;23:2020.
15. Get the Competitive Edge With The Latest Database Trends For 2020. [internet]. 2020. [citirano 14. 3. 2021]. Dostupno na: <https://penmypaper.com/blog/latest-database-trends-for-2020/>
16. Graovac J, Skripta iz predmeta Projektovanje baza podataka. [internet]. 2016. [citirano 14. 3. 2021]. Dostupno na: http://poincare.matf.bg.ac.rs/~jgraovac/courses/projbp/2016_2017/projbp_skripta.pdf
17. Corporate Finance Institute. What is a Decision Support System (DSS)? [internet]. 2020. [citirano: 15. 3. 2021]. Dostupno na: <https://corporatefinanceinstitute.com/resources/knowledge/other/decision-support-system-dss/>
18. MPercept Academy. Business Intelligence: The Leap You Need. [internet]. 2018. [citirano: 16. 3. 2021]. Dostupno na: <https://medium.com/@mperceptacademy/business-intelligence-the-leap-you-need-58b2742fd186>
19. Kostić M, skladišta podataka i OLAP tehnologija. [internet]. 2018. [citirano 4. 3. 2021]. Dostupno na: http://poincare.matf.bg.ac.rs/~vladaf/Courses/Matf%20MNSR/Prezentacije%20Individualne/Kostic_Skladiste_podataka_i_OLAP_tehnologija.pdf
20. Veljović A, Njeguš A, Osnove relacionih i analitičkih baza podataka. [internet]. 2004. [citirano 10. 3. 2021]. Dostupno na: <http://www.ftn.kg.ac.rs/konferencije/rppo13/Monografije/osnoverelacionihianalitickihbp.pdf>



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Značaj softverske podrške pri donošenju poslovnih odluka u kriznim situacijama

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Sažetak: Covid-19 pandemija izazvana koronavirusom SARS-Cov-2 odrazila se na sve sfere poslovanja, kao nijedna kriza do sada, zahtevajući od poslovnih sistema da prilagode svoje poslovne procese novim uslovima poslovanja. Brz razvoj na polju informacionih tehnologija omogućio je razvoj inteligentnih rešenja koji predstavljaju snažan oslonac procesu praćenja događaja u realnom vremenu i donošenja odluka na bazi tačnih i pravovremenih informacija. Značaj brzog prikupljanja podataka i njihova obrada u realnom vremenu postaju sve značajniji u savremenom načinu poslovanja, kao faktor koji doprinosi blagovremenoj reakciji na promene u poslovnom okruženju. U kriznim situacijama, poput pandemije Covid-19, primena softverskih alata za podršku odlučivanju koji se oslanjaju na savremena inteligentna tehnološka rešenja predstavljaju imperativ. Cilj ovog rada je da prikaže značaj i ulogu softverske podrške u procesu donošenja poslovnih odluka u različitim kriznim situacijama, sa osvrtom i na Covid-19 pandemiju. Rad je strukturiran na sledeći način: u prvom poglavlju razmatran je značaj donošenja poslovnih odluka, značaj informatičke podrške pri donošenju odluka i karakteristike funkcionisanja sistema za podršku odlučivanju. U nastavku rada prikazani su analiza vanrednih situacija i primeri informacionih sistema u različitim vanrednim situacijama.

Glavne reči: informacione tehnologije, softverski alati, krizne situacije, sistemi za podršku odlučivanju, dimenzioni model

1. Uvod

Pandemija izazvana koronavirusom Covid-19 nastupila je iznenada i dovela je do velikih poremećaja u radu u mnogim sektorima, smanjila potražnju za robom i povećala troškove poslovanja. Sa preko 299 miliona zaraženih i preko pet miliona smrtnih slučajeva na globalnom nivou (u trenutku pisanja rada) [1], mnoge vlade širom sveta u procesu donošenja odluka oslanjale su se na sisteme za podršku odlučivanju [2]. Brz razvoj informacionih tehnologija, u poslednjih nekoliko decenija, kako na polju mobilnih tehnologija tako i u sferi inteligentnih uređaja, omogućio je prikupljanje velike količine podataka (strukturiranih, polustrukturiranih i nestrukturiranih) i donošenje poslovnih odluka zasnovanih na tačnim i pravovremenim podacima [3], [4].

I pre izbijanja Covid-19 pandemije neke od karakteristika savremenog poslovnog okruženja bile su nestabilnost, jaka konkurencija, stalne promene tržišnih uslova i relativno kratak životni vek proizvoda. U takvim uslovima poslovanja na uspešnost poslovanja najviše utiču brzina i pouzdanost donošenja odluka i sprovođenje donetih odluka radi postizanja definisanih ciljeva. Često pri donošenju odluka nisu poznate neke činjenice od značaja, kao ni posledice koje će biti rezultat odluka. Tako se nametnula potreba za primenom upravljačkih alata i tehnologija koje mogu da pruže sveobuhvatno, brzo i efikasno korišćenje svih dostupnih podataka i informacija u poslovnim i vanposlovnim sistemima, koji su neophodni za uspešno obavljanje posla. Jedan od savremenih sistema koji omogućavaju korišćenje sveobuhvatnih informacija je sistem poslovne inteligencije – Business Intelligence (BI). To je sistem koji korisnicima daje mogućnost da pomoću tehnologija pristupa podacima, da ih analizira i upravlja njima radi donošenja poslovnih odluka. BI čine: „Skladište podataka – Data Warehouse, Sistemi za podršku odlučivanju, izvršni informacioni sistemi, onlajn analitička obrada podataka (OLAP) i implementacija” [5]. Sistemi poslovne inteligencije sve više se usmeravaju ka veb-aplikacijama, tako da korisnici rade istraživanja sa udaljenih lokacija preko veb-pregledača.

Vanredne situacije su situacije koje nastaju iznenada i takve situacije su praćene sukobljenim informacijama ili uopšte nema nikakvih informacija i sve se to dešava u veoma kratkom vremenskom periodu, što dodatno pogoršava proces donošenja odluka. U hitnim slučajevima osobe koje donose odluke moraju da imaju sva relevantna zapažanja i informacije koje su na raspolaganju kako bi donele ispravnu odluku primerenu datoj situaciji. „Takođe u literaturi postoji dosta dokumenata koji govore da je šansa za defektno donošenje odluka u grupi, poput grupnog razmišljanja, veća kada je situacija vrlo stresna i kada je grupa veoma kohezivna i socijalno izolovana” [6]. „Oni koji su uključeni u odlučivanje mentalno su preopterećeni i grupa ne uspeva da na adekvatan način odredi svoje ciljeve i alternative, ne istražuje sve mogućnosti, a takođe ne procenjuje rizike povezane sa samom odlukom grupe” [6].

Rad se bavi opštim temama poslovnog odlučivanja u prvom delu drugog poglavlja. U drugom delu drugog poglavlja se analizira dimenzioni model kao način predstavljanja podataka koji se primenjuju pri donošenju odluka. Treći deo drugog poglavlja detaljno opisuje značaj donošenja odluka u vanrednim situacijama i navedeni su primeri sistema za donošenje odluka u vanrednim situacijama.

2. Sistemi za podršku odlučivanja

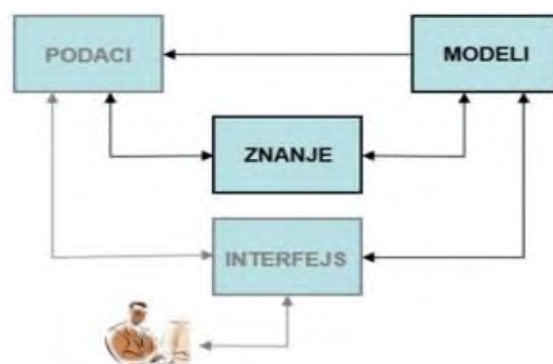
2.1. Sistemi za podršku odlučivanja i donošenje poslovnih odluka

Teorija odlučivanja koristi se pri pojedinačnom i kolektivnom donošenju odluka, posebno u neizvesnim situacijama. Cilj teorije odlučivanja je donošenje brze, optimalne i racionalne odluke. Savremena teorija odlučivanja nastala je u XX veku proučavanjem različitih

aspekata odlučivanja u okviru ekonomije, statistike, psihologije, filozofije, političkih i društvenih nauka [7]. Savremeno poslovanje se karakteriše povećanjem spoljašnje i unutrašnje složenosti organizacije, nestabilnim okruženjem, jakom konkurencijom, stalnom promenom tržišnih uslova, relativno kratkim životnim vekom proizvoda, velikim brojem informacija koje dolaze iz okruženja u kome organizacija posluje. U takvim uslovima poslovanja na njegovu uspešnost najviše utiču brzina i pouzdanost donošenja odluka i sprovođenje donetih odluka radi postizanja definisanih ciljeva. Da bi se ubrzao i olakšao proces donošenja poslovnih odluka, sve više se koriste računari i određeni programi, koji obrađuju podatke i kroz izveštaje daju informacije, na osnovu kojih se mogu doneti pravovremene, tačne i kvalitetne odluke.

Pomoć računara pri donošenju odluka menadžmentu kompanije će olakšati rukovođenje kompanijom, što daje mogućnost da se postignu bolji poslovni rezultati. S obzirom na to da je odlučivanje u savremenom svetu postalo složen proces, u procesu odlučivanja učestvuje tim ljudi. U savremenom svetu odlučivanje je postalo složen i odgovoran proces, pa je za taj proces postalo neophodno učešće timova ljudi. Podatak je surova činjenica, a analizom podataka dobija se informacija. Znanje je akumuliran skup informacija koji ima značajnu ulogu u donošenju ispravnih odluka [7]. Problemi koji se mogu predstaviti matematičkim instrumentima zovu se strukturirani ili programirani problemi. Takvi problemi imaju standardne algoritme rešavanja pri donošenju odluka, što olakšava proces odlučivanja [5]. Nestrukturirani ili neprogramirani problemi se ne mogu izraziti standardnim matematičkim instrumentima, samim tim metode rešavanja ovakvih problema nisu unapred poznate, tako da se pri odlučivanju koristi intuicija donosioca odluke [5]. Delimično programirani ili strukturirani problemi imaju delove koji su delimično strukturirani i delove koji nisu strukturirani, tako da rešenje zavisi od toga koji se deo problema rešava [5].

Za rad sa nestrukturiranim podacima koriste se tehnike Data Mining i algoritmi mašinskog učenja. U Data Mining tehnike spadaju stablo odlučivanja, veštačke neuronske mreže i genetski algoritmi. Algoritmi mašinskog učenja pogodni su za rad sa velikom količinom podataka i primenjuju se u situacijama kada je potrebno pronaći zakonitosti među podacima [5]. Za rad sa polustrukturiranim podacima koriste se skladišta podataka i dimenzioni model. Pomoću sistema za podršku odlučivanju dobijaju se kvalitetnije informacije, koje daju veću mogućnost izbora i analizu posledica pri donošenju odluka, što pozitivno utiče na kvalitet donošenja odluka [5].



Slika 1. Elementi sistema za podršku odlučivanju [12]

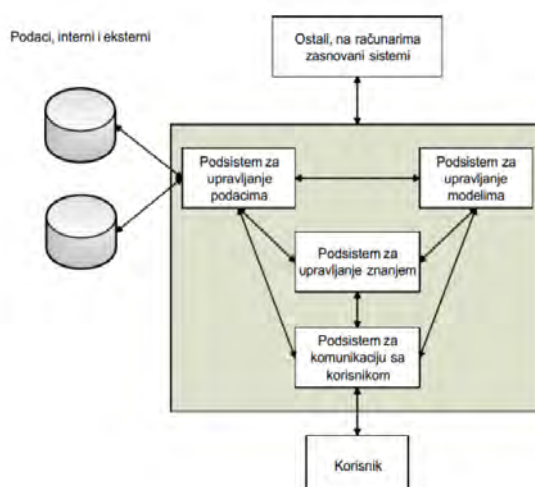
Prednost sistema za podršku odlučivanju je što olakšavaju donošenje odluka, daju više informacija, daju prikaz mogućih posledica pri donošenju odluka [5].

Primeri sistema za podršku odlučivanja (Decision Support Systems – DSS) su [5]:

- » sistem za upravljanje proizvodnjom;
- » sistem za upravljanje ljudskim resursima;
- » sistem za upravljanje saobraćajem;
- » sistem za projektovanje ruta vožnje, reda vožnje i reda letenja;
- » sistem u računovodstvu;
- » sistem za procenu troškova.

Komponente sistema za podršku odlučivanju su (slika 2) [5]:

- » deo za upravljanje podacima;
- » deo za upravljanje modelima;
- » deo za upravljanje znanjima;
- » podsistem – korisnički interfejs;
- » korisnik.



Slika 2. Sistem za podršku odlučivanju – komponente [13]

Da bi sistem za podršku odlučivanju funkcionisao, potrebno je obezbediti ulaz podataka. Podaci se mogu prikupljati iz sistema gde se primenjuje odlučivanje, tj. unutar kompanije, i to su unutrašnji podaci, i iz okruženja i to su spoljašnji podaci. Najznačajniji deo podataka su parametri na osnovu kojih se mogu simulirati ponašanja sistema u različitim uslovima. Prikupljeni podaci se skladište u baze podataka ili Data Warehouse – skladište podataka. Komponente sistema za upravljanje podacima čine baze podataka, deo za upravljanje podacima i upite. Sistem za podršku odlučivanju ostvaruje vezu sa bazom podataka pri unosu podataka. Takođe, i internet može biti izvor spoljašnjih podataka i podaci se mogu uneti direktno u formi aplikacije [5].

Deo sistema za upravljanje modelima čine [5]:

- » baze modela;
- » upravljački deo baza modela;
- » jezik za modeliranje skupa modela;
- » komandni procesor.

Sistem za podršku odlučivanju čini model za podršku odlučivanju. Svaki DSS može da sadrži različite modele za donošenje različitih odluka, što zavisi od potreba i namene DSS-a. Na primer, postoje modeli za: planiranje proizvodnje, prognoziranje prodaje, raspoređivanje vozila, pozicioniranje prodajnih objekata [5]. Modeli za podršku odlučivanju koriste tehnike simulacije, tehnike optimizacije i heurističke algoritme. Primenom tehnika simulacije simulira se ponašanje realnog sistema promenom parametara okruženja, čime se dobija moguće ponašanje modela realnog sistema [5]. Tehnike optimizacije omogućavaju da se dobije najbolje rešenje problema na osnovu definisanih kriterijuma. Optimizacione tehnike obuhvataju primenu linearnog programiranja, dinamičko programiranje i sl. Optimizaciona tehnika ima svojih nedostataka, a to je da se povećanjem dimenzija problema usporava rad računara i nije ih moguće sve ugraditi u model, pa rešenja ne odgovaraju realnom sistemu. Za rešavanje problema sa velikim brojem ograničenja i modela velikih dimenzija primenjuju se heuristički algoritmi. Heuristika pronalazi dobra rešenja u kratkom vremenskom periodu, ali kod heuristike nije pouzdano da li će rešenje biti blisko optimalnom [5]. Za donošenje odluka pomoću DSS-a u realnom vremenu osnovni zahtev je brzina dobijanja rešenja, tj. očekuje se da dobijena rešenja treba da budu brza i kvalitetna. Kombinacija optimizacionih i heurističkih tehnika i iskustva donosioca odluka koja opisuju različite delove realnog sistema daje sveobuhvatni instrument za dobijanje zadovoljavajućih rešenja realnih problema [5].

Deo za upravljanje znanjem opstaje samostalno ili se ugrađuje kao deo nekog drugog podsistema. Ono što ga izdvaja je povezanost sa bazom znanja, što omogućava ekspertizu problema koji korisnik rešava. U podsistem mogu biti ugrađeni ekspertni sistemi, neuronske mreže, inteligentni sistemi i sl. Sistemi za podršku odlučivanja koji poseduju sistem za upravljanje znanjem zovu se „Knowledge Based – DSS“, „Intelligent Decision Support Systems – IDSS“ ili „DSS/ES – kao kombinacija“ [5].

Ovaj deo je zadužen za komunikaciju između DSS-a i korisnika. Korisnik preko korisničkog interfejsa pristupa DSS-u radi dobijanja informacija za donošenje odluka. Radi što efikasnijeg korišćenja interfejsa, potrebno je definisati standard za izgled ekrana, koristiti standardne i razumljive termine i oznake, omogućiti da se menjaju parametri interfejsa, omogućiti laku navigaciju i sl. Korisnički interfejs omogućava unos podataka, kreiranje modela i prikaz podataka [5].

2.2 Skladište podataka i dimenzioni model

Potreba za čuvanjem velike količine podataka dovela je do toga da se ti podaci čuvaju u obliku koji omogućava brz pristup. Najčešće se koriste relacione baze podataka u kojima su podaci organizovani u tabelama međusobno povezanih relacijama. Čuvanje podataka u relacionim bazama ima ograničenja koja se odražavaju na dobijanje kvalitetnih i pravovremenih informacija za donošenje odluka. U različitim bazama podaci se različito predstavljaju, koriste se različiti načini označavanja za iste podatke, pa je teško definisati upite za takve baze. Podaci se iz različitih baza prikupljaju, čime se postupak obrade tako velike količine podataka i dobijanja informacija produžava i usložnjavaju se proračuni, što usporava proces donošenja odluka. Relacione baze podataka se često ažuriraju, tako da se čuvaju samo novi podaci, a nekada su potrebni i prethodni podaci za odluke. Iz tog razloga se zanimljivi podaci prikupljaju i integrišu u jedan sistem koji se zove skladište podataka (engl. Data Warehouse) [7].

Za čuvanje i strukturiranje podataka u skladištu podataka koristi se tzv. dimenzioni model. Dimenzioni model je model podataka koji je pogodan za analizu podataka radi donošenja odluka. Podaci u dimenzionalnom modelu nisu normalizovani, tj. sadrže redundanse. Iz tog razloga troše više memorije, ali daju i veće mogućnosti korišćenja u analitičke svrhe, brže se pristupa podacima [7].

Podaci u skladištu podataka mogu se predstaviti u obliku multidimenzionalne strukture koja se zove kocka (cube). Novi način analize, lakog i selektivnog izveštavanja i pregleda podataka sa različitih podataka koje je bazirano na kocki zove se OLAP (Online Analytical Processing, slika 3) [7]. Softverska rešenja koja integrišu sve glavne komponente potrebne za analizu podataka zovu se „Platforme poslovne inteligencije“ (engl. Business Intelligence Platforms, slika 3) [7].

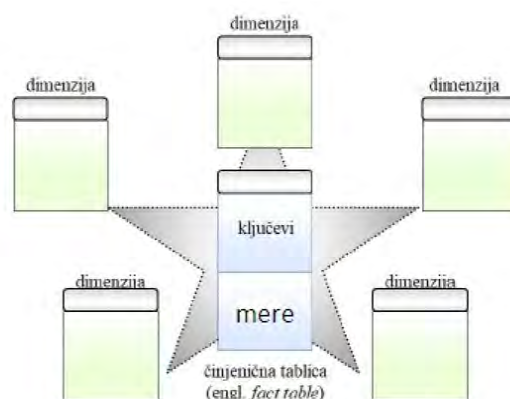


Slika 3. Poslovna biznis inteligencija [14]

Postupak skladištenja podataka se odvija kroz sledeće faze [7]:

- » izdvajanje, transformacija i učitavanje podataka (Extraction, Transformation and Loading – ETL);
- » smeštanje podataka;
- » upotreba podataka za potrebe odlučivanja.

Najobuhvatniji i najznačajniji deo je proces izdvajanja, transformacije i učitavanja podataka. Značaj ovog postupka se ogleda u identifikaciji izvora podataka, izdvajanjem zanimljivih podataka. Ovaj proces najduže traje. Ti podaci se po potrebi ujedinjuju, transformišu i učitavaju u skladište podataka. Pri skladištenju podataka obraća se pažnja na mogućnost brzog i efikasnog pristupa podacima, sigurnost i trajnost podataka [7]. Upotreba podataka se realizuje kroz upite na skladištu podataka, izradu izveštaja, grafove, analizu podataka i izvlačenje zakonitosti u podacima. Posebna tehnika za čuvanje podataka i njihovu manipulaciju u skladištu podataka koji su optimizovani za analitičku upotrebu, pomoću posebnog upitnog jezika, zove se OLAP (On Line Analytical Processing), onlajn analitička obrada. U okviru ove tehnike koristi se Cross Tab upit po redovima i kolonama [7]. Za pronalaženje skrivenih, nepoznatih činjenica unutar skladišta podataka koje omogućavaju pronalaženje budućih ponašanja koristi se tehnika dubinske analize (Data Mining) [7]. Relacione baze podataka imaju neke nedostatke koji onemogućavaju dobijanje dovoljno preciznih podataka za donošenje odluka [7]. Dimenziono oblikovanje je tehnika logičkog oblikovanja podataka u jednostavnom intuitivnom obliku, koji je lakši za pregled. Dimenzioni model sadrži redundantne podatke, jer se na njemu ne primenjuju normalne forme. Svaki model sadrži jednu tabelu sa kompozitnim primarnim ključem – činjeničnu tabelu i grupu manjih tabela, koje se zovu dimenzione table. Svaka dimenziona tabela sadrži jednostavan primarni ključ koji odgovara jednom od atributa kompozitnog primarnog ključa činjenične table. Ovakva struktura se zove zvezdasti model (Star Join) (slika 4) [7].



Slika 4. Zvezdasti model [15]

Činjenična tabela sadrži grupe numeričkih atributa:

- » ključeve dimenzijskih tabela;
- » mere.

Činjenične table su normalizovane ili skoro normalizovane. Mere su numerički atributi u činjeničnoj tabeli, dodaju se za svaku kombinaciju spoljašnjih ključeva koji definišu neki zapis, predstavljaju ocenu procesa koja se prati činjeničnom tabelom ili opis mere neke pojave [7].

Arhitektura skladišta podataka nije unapred definisana, već zavisi od samog poslovanja. Najčešće se sreću sledeći oblici [7]:

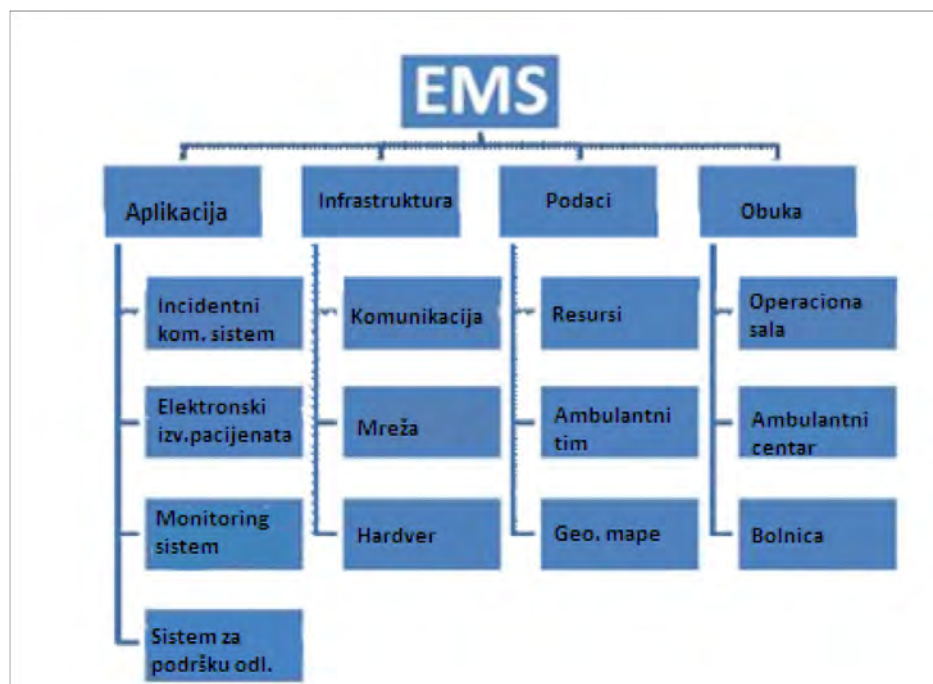
- » kao izvori podataka najčešće se sreću baze podataka ili više baza, datoteke, veb-servisi;
- » područje za pripremu (Data Staging Area); predstavljeno je jednom bazom podataka i služi za prikupljanje i transformaciju podataka;
- » operaciono skladište podataka (Operational Data Store) u formi baza podataka u kojoj korisnici dnevno ažuriraju podatke;
- » skladište podataka (Data Warehouse), sistem za upravljanje relacijskim bazama podataka;
- » OLAP, sistem upravljanja nerelacijskim bazama podataka, ubrzava obavljanje upita i dodatne analize;
- » alati pogodni za pregled, analizu, vizuelizaciju.

2.3 Značaj softverske podrške u vanrednim situacijama

Sistemi za podršku odlučivanju našli su svoju primenu u različitim kriznim situacijama, upravo zbog svojih osobina da mogu da [8]:

- » građanima obezbede važne informacije u kriznim situacijama;
- » prikupljaju, skladište i obrađuju podatke iz različitih informacionih sistema;
- » omoguće koordinaciju različitih donosioca odluka;
- » predviđaju ishode odluka koje se donose.

Za potrebe blagovremenih reakcija u sektoru zdravstva razvijen je informativni sistem za upravljanje vanrednim situacijama (Emergency Medical Services – EMS). To je baza podataka za odgovor na kritične situacije koja pruža grafičke informacije u realnom vremenu. Kritične situacije predstavljaju brojne prepreke za integraciju i koordinaciju hitnih akcija u zdravstvenom sistemu [9]. Cilj ovog projekta bio je izgradnja pouzdane i dobro povezane infrastrukture. Pored ovoga, projekat primenjuje inteligentni sistem za podršku odlučivanju radi unapređenja poslovanja procesa. Projekat uključuje: kompletan kompjuterizovani sistem komandovanja kritičnim situacijama; kompjuterizovani sistem za elektronsko izveštavanje o nezi pacijenta, sistem za nadzor u centralnom delu – operaciona sala [8]. EMS takođe omogućava specijalizovanom odeljenju za hitne slučajeve (ED) za zarazne bolesti identifikaciju i upravljanje pacijentima sa kritičnim infektivnim bolestima stanja (tj. teškom infekcijom respiratornog trakta, teškom infekcijom centralnog nervnog sistema (CNS) i sepsom). EMS se zasniva na tehnologijama i alatima koji su široko dostupni, kao što su serveri, Microsoft® operativni sistem (OS), Oracle Database Management System (DBMS), Geografski informacioni sistemi (GIS), Network Analyst i Tracking Analyst [9]. EMS ima četiri glavne integrisane systemske komponente: infrastrukturu, aplikaciju, podatke i obuku (slika 5) [9].



Slika 5. Emergency Medical Services – EMS – servis za hitne medicinske slučajeve

U nedavnoj prošlosti dogodilo se nekoliko industrijskih katastrofa velikih razmera koje su prouzrokovale znatne gubitke ljudskih života i štetu u životnoj sredini. Dana 3. decembra 1984. u Bopalu je iz hemijske fabrike „Union Carbide“ iscurilo 40 tona toksičnog gasa metil-izocijanata, što je usmrtilo najmanje 15.000 ljudi i ranilo još oko 150.000. Manje poznati primer, ali sa još većim uticajem, dogodio se u provinciji Henan u Kini, gde je zbog propadanja brana Bankjao i Šimantan tokom tajfuna „Nina“ 1975. ubijeno 26.000 ljudi, dok je 145.000 umrlo tokom sledećih epidemija i gladi. U toj katastrofi srušilo se oko šest miliona objekata i ukupno je pogođeno više od 10 miliona stanovnika. Međutim, od svih industrijskih katastrofa u novije vreme nuklearna katastrofa u Černobilju 1986. verovatno podseća na najapokaliptičnije vizije svetske devastacije [6]. Najveća nuklearna katastrofa na svetu dogodila se 26. aprila 1986. godine u nuklearnoj elektrani Černobilj u Pripjatu, u Ukrajini, u bivšem Sovjetskom Savezu. Veruje se da je uzrok katastrofe eksperiment u reaktoru koji je krenuo naopako, što je dovelo do eksplozije reaktora. Kako nije bilo zgrade za zadržavanje reaktora, u atmosferu je pušten radioaktivni sadržaj koji je kontaminirao velika područja u bivšem Sovjetskom Savezu (posebno u Ukrajini, Belorusiji i Rusiji), istočnoj i zapadnoj Evropi, Skandinaviji i istoku Severne Amerike, u danima i nedeljama nakon nesreće [6].

Različiti i često suprotstavljeni odgovori različitih evropskih zemalja nakon černobiljske katastrofe jasno su stavili do znanja da je u Evropskoj uniji potreban sveobuhvatan odgovor na nuklearne vanredne situacije. Finansirana od strane Evropske komisije kroz brojne istraživačke programe (tzv. okvir programi), grupa univerziteta i istraživačkih institucija iz Evrope i bivšeg Sovjetskog Saveza sarađivali su na razvoju sistema za podršku odlučivanju u realnom vremenu (RODOS). RODOS je namenjen za podršku pri upravljanju vanrednim situacijama nakon nuklearne nesreće na svim nivoima društva (lokalnom, regionalnom i nacionalnom) u celoj Evropi. Cilj je bio da RODOS [6]:

- » obezbedi zajedničku platformu ili okvir za uključivanje najboljih karakteristika postojećeg DSS-a i budućeg razvoja;
- » obezbedi veću transparentnost u procesu donošenja odluka kao jedan od ulazaka u poboljšanje javnog razumevanja i prihvatanja vanrednih mera;
- » olakša poboljšanu komunikaciju između zemalja u praćenju podataka, predviđanju posledica itd. u slučaju bilo koje buduće nesreće;
- » promoviše, kroz razvoj i upotrebu sistema, koherentniji, dosledniji i usklađeniji odgovor na bilo koju buduću nesreću koja može uticati na Evropu.

Ukupni RODOS DSS sastoji se od tri različita podsistema, od kojih svaki sadrži niz modula [6]:

- » Moduli podsistema analize (Analyzing Subsystem – ASI), koji obrađuju dolazne podatke i predviđaju mesto i količinu kontaminacije, uključujući vremenske varijacije. Ovi moduli sadrže meteorološke, atmosferske disperzije, hidrološke disperzije, taloženje i apsorpciju, efekte na zdravlje i druge modele. ASI moduli predviđaju razvoj situacije u skladu sa najboljim naučnim razumevanjem uključenih procesa;
- » Moduli podsistema za protivmere (Countermeasure Subsystem – CSI), koji predlažu moguće protivmere, proveravaju ih izvodljivošću i izračunavaju očekivanu korist u smislu niza kriterijuma;
- » Moduli podsistema za evaluaciju (Evaluating Subsystem – ESI), koji rangiraju strategije protivmera prema njihovim potencijalnim koristima i preferencama koje su doneli donosioci odluka.

Međusobnim povezivanjem svih programskih modula, unosom, prenosom i razmenom podataka, prikazom rezultata i načinima rada (interaktivni i automatski) upravlja RODOS operativni sistem, sloj izgrađen pod UNIKS operativnim sistemom glavnog računara. Interakcija sa korisnicima i prikaz podataka odvija se putem grafičkog podsistema, koji uključuje namenski izgrađen geografski informacioni sistem (RoGIS). Ovo bi prikazalo demografske, topografske, ekonomske i poljoprivredne podatke zajedno sa konturama izmerenih ili predviđenih radioloških podataka. Ovi prikazi nastoje da osiguraju da rezultate mogu da koriste i razumeju različiti korisnici [6].

RODOS je mrežni sistem u realnom vremenu povezan sa meteorološkim i radiološkim mrežama podataka, čime uključuje nekoliko komunikacionih modula. Svi podaci potrebni modulima za obradu informacija čuvaju se u bazama podataka, od kojih u RODOS-u postoje tri glavne kategorije [6]:

- » baza podataka koja čuva programske podatke koji uključuju ulazne i izlazne podatke potrebne ili proizvedene od različitih modula, srednje i konačne rezultate, privremene podatke itd.;
- » baza podataka u realnom vremenu koja sadrži informacije koje dolaze iz regionalnih ili nacionalnih radioloških i meteoroloških mreža;
- » geografska baza podataka koja sadrži geografske i statističke informacije za celu Evropu.

Sistem je dizajniran da bude fleksibilan kako bi podjednako dobro funkcionisao u različitim okolnostima. Stoga se sadržaj

podсистема i baza podataka razlikuje u zavisnosti od specifične primene sistema, tj. prirode i karakteristika bilo koje potencijalne nuklearne nesreće, različitih podataka o monitoringu, nacionalnih propisa itd. RODOS modeli i baze podataka mogu se prilagoditi različitim karakteristikama lokacija, kao i geografskim, klimatskim i ekološkim varijacijama širom Evrope. Trenutna verzija sistema RODOS instalirana je u nacionalnim hitnim centrima za upotrebu u Nemačkoj, Finskoj, Španiji, Portugaliji, Austriji, Holandiji, Poljskoj, Mađarskoj, Slovačkoj, Ukrajini, Sloveniji i Češkoj. Instalacija se razmatra u nekoliko drugih zemalja poput Rumunije, Bugarske, Rusije, Grčke i Švajcarske. Kao posledica toga RODOS je danas gotovo centralizovani resurs za sve relevantne informacije koje bi mogle biti potrebne u bilo kojoj potencijalnoj krizi nuklearne elektrane u Evropskoj uniji [6].

ReliefWeb (<http://www.reliefweb.int>) je vodeća svetska mrežna veza sa informacijama o humanitarnim vanrednim situacijama i katastrofama. Putem ReliefWeb Office for the Coordination of Humanitarian Affairs (OCHA) pruža informacije o složenim vanrednim situacijama i prirodnim katastrofama širom sveta iz preko 1.000 izvora, uključujući UN, vlade, nevladine organizacije (NVO), akademsku zajednicu i medije. ReliefWeb objedinjuje konačne izveštaje, dokumente i izveštaje humanitarnih partnera, pružajući globalno skladište na jednom mestu za informacije o hitnim reakcijama [9]. Regional Information Networks (IRIN) prikuplja informacije iz niza humanitarnih i drugih izvora, pružajući kontekst i izveštavajući o vanrednim situacijama i rizičnim zemljama [6]. Information Management Units (IMU) i Humanitarian Information Centers (HIC) prikupljaju operativne podatke i informacije, upravljaju njima i dele ih na terenskom nivou, pružajući geografske informacione proizvode i niz operativnih baza podataka i srodni sadržaj donosiocima odluka na terenu, kao i sedištu [6]. VISTA je primer novog alata za vizuelizaciju zasnovan na mreži koji ne samo da pruža informaciju o situaciji već takođe omogućava i humanitarnu analizu situacije [6].

Sahana je alat za saradnju zasnovana na mreži koja se bavi uobičajenim problemima koordinacije tokom katastrofe zbog pronalaska nestalih ljudi, upravljanja pomoći, upravljanja dobrovoljcima, praćenja mesta preseljenja itd. između vladinih grupa, civilnog društva (NVO) i samih žrtava. Sahana je integrisani skup aplikacija za upravljanje katastrofama zasnovanih na mreži koje pružaju rešenja za velike humanitarne probleme nakon katastrofe. Glavne aplikacije i problemi kojima se bave su sledeći [6]:

- » Registar nestalih: pomaganje u smanjenju traume efikasnim pronalaženjem nestalih osoba;
- » Registar organizacija: koordiniranje i uravnoteženje distribucije organizacija za pružanje pomoći u pogođenim područjima i povezivanje grupa za pomoć, omogućavajući im da deluju kao jedna;
- » Sistem upravljanja zahtevima: registrovanje i praćenje svih dolaznih zahteva za podršku i pomoć do ispunjenja i pomoć donatorima da se povežu sa zahtevima za pomoć;
- » Registar logora: praćenje lokacije i broja žrtava u raznim logorima i privremenim skloništima postavljenim širom pogođenog područja.

Razvoj Sahane, besplatnog sistema otvorenog koda za upravljanje katastrofom, pokrenut je zbog cunamija 2004. godine da bi pomogao u koordinaciji napora za pomoć na Sri Lanki. Prvobitno ga je izgradila grupa dobrovoljaca iz industrije informacione tehnologije (IT) Sri Lanke, a predvodila ga je Lanka Software Foundation. Primenu Sahane odobrio je i primenio CNO (glavno vladino telo na Sri Lanki koje koordinira napore za pomoć) kako bi pomogao u koordinaciji svih podataka koji se prikupljaju. Radi globalne primene i radi adekvatnog odgovora na katastrofe velikih razmera i dalje se radi na unapređenju sistema Sahana. Sahana je uspešno korišćena nakon nekoliko velikih prirodnih katastrofa, na primer nakon velikog zemljotresa u Pakistanu 2005. i katastrofe prouzrokovane olujom na Filipinima i zemljotresa u Jogjakarti 2006. Dugoročni ciljevi Sahane su da rastu u kompletan sistem upravljanja katastrofama, uključujući funkcionalnost za ublažavanje, pripremu, pomoć i oporavak [6].

5. Zaključak

Neizvesnost i brze promene u realnom okruženju su jedna od glavnih odlika svake krizne situacije. Kao takve, krizne situacije stvaraju diskontinuitet u funkcionisanju poslovnih sistema, predstavljaju pretnju po život ljudi i narušavaju razvoj, kako na lokalnom tako i na globalnom nivou [10].

Donošenje pravovremenih odluka u takvim situacijama direktno je povezano sa mogućnošću pristupa realnim podacima. Inovacije na polju informacionih i komunikacionih tehnologija dovele su do razvoja sistema za podršku odlučivanju koji omogućavaju prikupljanje, obradu i prostorno prikazivanje podataka u vezi sa datom kriznom situacijom, što je donosiocima odluka omogućilo sagledavanje i praćenje situacije u realnom vremenu, kao i blagovremeno reagovanje [11].

Reference

1. Worldometers. Coronavirus cases. [Internet]. 2020. Available from: <https://www.worldometers.info/coronavirus/>
2. Sheng J, et al. COVID-19 pandemic in the new era of big data analytics: Methodological innovations and future research directions. *British Journal of Management*; 2021. 32.4: pp. 1164–1183.
3. Wu L, Hitt L, Lou B. Data analytics, innovation, and firm productivity, *Management Science*; 2020. 66: pp. 1783–2290.
4. Lurie NH, Swaminathan JM. Is timely information always better? The effect of feedback frequency on decision making. *Organizational Behavior and Human decision processes*; 2009. 108.2: pp. 315–329.
5. Mišković V. Sistemi za podršku odlučivanju. Prvo izdanje. Beograd: Univerzitet Singidunum; 2013.
6. Van de Vale B, Turof M. Decision support for emergency situation <https://link.springer.com/article/10.1007/s10257-008-0087-z>
7. Milić M. Odlučivanje i poslovna inteligencija. Banja Luka: Univerzitet za poslovni inženjering i menadžment; 2014.
8. Fertier A, et al. A new emergency decision support system: the automatic interpretation and contextualisation of events to model a crisis situation in real-time. *Decision Support Systems*; 2020. 133: 113260.
9. Internet, dostupno na: <https://www.fema.gov/disaster/1603>
10. Nikolić, M. Uloga informacionih sistema u katastrofama: The role of information systems in disaster. *Zbornik radova – Taktika zaštite i spasavanja u vanrednim situacijama*, Beograd; 2021. 1.1: pp. 163–175.
11. Knežević J. Završni rad „Značaj softverske podrške pri donošenju poslovnih odluka u uslovima pandemije“. Beograd: Visoka škola strukovnih studija za informacione tehnologije – ITS.
12. Mišković V. Sistemi za podršku odlučivanju. Beograd: Univerzitet Singidunum; 2013. str. 5.
13. Živadinović J. Menadžment informacioni sistemi, PEP Beograd; 2013. str. 40. Dostupno na: <https://scindeks-clanci.ceon.rs/data/pdf/2334-816X/2014/2334-816X1402033M.pdf> (posećeno 18. 9. 2020).
14. Pantelić O. Analitička obrada podataka. Beograd: Fakultet organizacionih nauka; 2016. slajd 6.
15. Mekterović I, Brkić Lj. Skripta – Skladišta podataka i poslovna inteligencija. 2017. str. 14.



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Importance of software support in crisis situations decision-making

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Summary: The COVID-19 pandemic caused by the Sars-Cov2 coronavirus has affected all spheres of business like no crisis before, forcing business systems to adapt their business processes to the newly emerged business conditions. Rapid development in the field of information technologies has given rise to the development of new intelligent solutions that strongly support real-time monitoring, and decision-making based on accurate and timely information. The importance of fast data collection and their processing in real time is becoming increasingly important in modern business, as a factor that contributes to a timely response to changes in the business environment. In crisis situations, such as the global COVID-19 pandemic, the application of software tools, based on modern intelligent technological solutions, to support decision-making is an imperative. The aim of this paper is to show the importance and role of software support in crisis situations decision-making with emphasis on the COVID-19 pandemic. The paper is structured as follows: the first chapter discussed the importance of business decision-making, importance of software support in such decision-making, and the characteristics of decision support systems. The paper will also present the analysis of emergency situations and examples of information systems in different emergency systems.

Key terms: : information technologies, software tools, crisis situations, decision support systems, dimensional model

1. Introduction

The pandemic caused by the COVID-19 virus came out of nowhere and caused major disruptions in various sectors, reduced demand for goods, and increased operating costs. With over 299 million infected, and five million deaths globally (at the time of writing) [1], many governments around the world had to rely on decision support systems [2]. The rapid development of information technologies in the last few decades, both in the field of mobile technologies and in the field of intelligent devices, has enabled the collection of large amounts of data (structured, semi-structured and unstructured), and business decisions based on accurate and timely data [3], [4].

Even before the outbreak of the COVID-19 pandemic, the contemporary business environment was characterized by instability, strong competition, constant changes in market conditions, and a relatively short product life. In such conditions, business success is largely influenced by the speed and reliability of decision-making, and decision implementation to achieve defined goals. In decision-making, some important facts often remain unknown, as well as the consequences of one's decisions. Hence, the need for the application of management tools and technologies that can provide comprehensive, fast and efficient use of all available data and information in business and non-business systems, which are necessary for successful business performance. One of these systems that enable the use of comprehensive information is Business Intelligence (BI). It is a system that enables users to use technology to access data, analyze and manage them for the purpose of making business decisions. BI comprises: "Data Warehouse, Decision support systems, Executive information systems, online analytical processing (OLAP), and implementation" [5]. Business intelligence systems are increasingly shifting toward web applications in order to enable users to perform research from remote locations via web browsers.

Emergency situations are situations that arise suddenly. They are either accompanied by conflicting information, or no information at all, and they occur in a very short period, which only further impairs the decision-making process. In emergencies, decision-makers must have all the relevant observations and information available so as to be able to make decisions appropriate to the situation. "In addition, literature mentions various documents arguing that the chances of defect decision-making in a group, such as group thinking, are greater than in stressful situations when the group is very cohesive or socially isolated" [6]. "Those involved in decision-making are mentally overwhelmed and the group fails to adequately define its goals and alternatives, does not explore all possibilities, nor does it assess the risks associated with the group's decision" [6].

The paper covers general topics related to decision-making in the first section of the second chapter. The other half of the chapter analyzes the dimensional model as a way of warehousing data in decision-making. The third part of the said chapter describes the importance of decision-making in emergencies, and presents examples of emergency decision-making systems.

2. Decision support systems

2.1 *Decision support systems and business decision support systems*

Decision theory is used in individual and collective decision-making, especially in uncertain situations. The aim of decision theory is to make quick, optimal and rational decisions. Contemporary decision theory emerged in the 20th century by studying different aspects of decision-making in the field of economics, statistics, psychology, philosophy, political and social science [7]. Modern business is characterized by an increased internal and external organizational complexity, unstable environment,

strong competition, constant changes in market conditions, relatively short product life, and large amounts of information in the business environment. In such conditions, business success is largely influenced by the speed and reliability of decision-making and decision implementation to achieve defined goals. Computers and specialized software that process data and provide information through reports based on which accurate, timely and quality decisions can be made are increasingly used to speed up and facilitate the business decision-making process.

Software support in decision-making facilitates management of a company, and enables better business results. Given that decision-making has become a complex and highly responsible process in the modern world, it now requires the involvement of whole teams of people. Data are raw facts, and their analysis yields information. Knowledge is an accumulated set of information that has a significant role in making correct decisions [7]. Problems that can be represented by mathematical instruments are called structured or programmed problems. Such problems have standard solving mechanisms which facilitate decision-making [5]. Unstructured or unprogrammed problems cannot be expressed by standard mathematical instruments, therefore the methods for solving such problems are not known in advance, so decision-makers must use their intuition [5]. Semi-structured or semi-programmed problems have partially structured parts, and unstructured parts, so the solution depends on the part of the problem which is being solved [5].

Data Mining techniques and machine learning algorithms are used for working with unstructured data. Data mining techniques include the decision tree, artificial neural networks and genetic algorithms. Machine learning algorithms are suitable for working with large amounts of data, and are applied in situations when it is necessary to find patterns among data [5]. Data warehouses and the dimensional model are used for working with semi-structured data. The decision support system generates better information, which allows for greater choice and consequence analysis in decision-making, thus positively influencing the quality of decision-making [5].

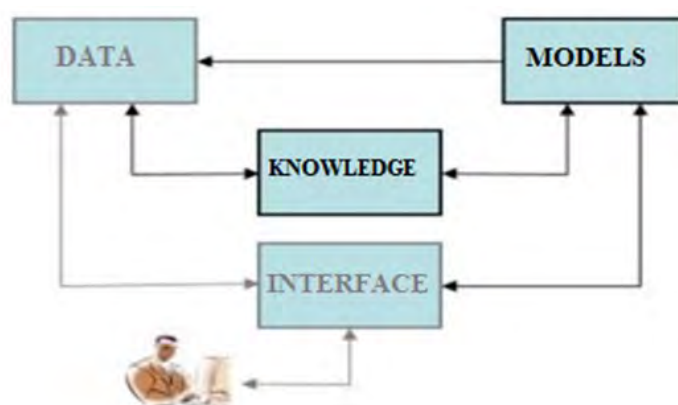


Figure 1. Decision support system elements [12].

The advantage of decision support systems is that they facilitate decision-making, provide more information, and provide an overview of potential consequences of decision-making [5].

Examples of Decision Support System or DSS are [5]:

- » Production management system;
- » Human resource management system;
- » Traffic management system;
- » Public transport timetable, routes and flight schedule design system;
- » Accounting system;
- » Cost estimation system.

Components of the decision support system (Figure 2) are [5]:

- » Data-management subsystem;
- » Model management sub-system;
- » Knowledge-based subsystem;
- » User interface;
- » User.

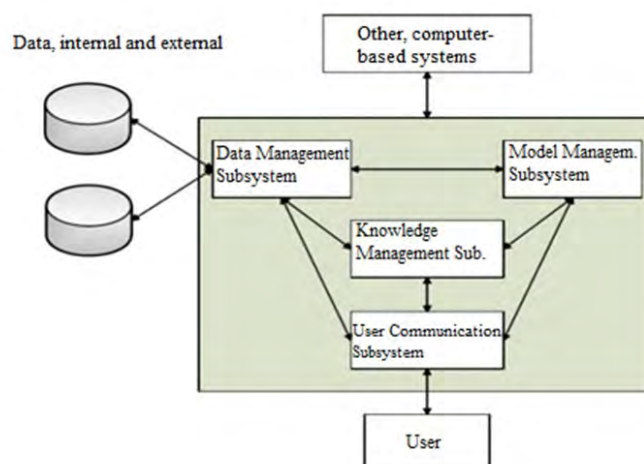


Figure 2. Decision support system – components [13].

In order for a decision support system to work, it needs data entry. Data can be collected from the decision-making system, i.e. from inside the company, and they are internal data, and from the environment, i.e. external data. The most important components of the data are the parameters based on which it is possible to simulate the behavior of the system in different circumstances. The collected data are stored in databases, or data warehouses. The components of a data management system are: databases, data management subsystem, and queries. The decision support system established connection with the database during data entry. In addition, the Internet can also be an external data source, and the data can be entered directly, i.e. through an application [5].

Components of the model management subsystem are [5]:

- » model databases;
- » model database management subsystem;
- » language for set modeling;
- » command processor.

The decision support system comprises a decision support model. Each DSS may contain different decision-making models, depending on the purpose and needs of the DSS. For example, there are models for: production planning, sales forecasting, vehicle scheduling, sales venue positioning [5]. Decision support models use simulation techniques, optimization techniques, and heuristic algorithms. By applying simulation techniques, we simulate the behavior of an actual system by changing environmental parameters, thus obtaining potential the possible behavior of a real-system model [5]. Optimization techniques allow us to generate the best possible solution to the problem based on the specified criteria. Optimization techniques include application of linear programming, dynamic programming, etc. The optimization technique has its drawbacks, for example, increasing problem dimensions slows down the computer, and it is not possible to incorporate all of them into a model, so the solution does not correspond to the actual system. Heuristic algorithms are used for solving problems with a large number of constraints and large-dimension models. Heuristics is capable of finding good solutions in a short period, but it is not completely reliable, because we cannot know if the solution will be close to optimal or not [5]. For making decisions in real time using DSS, the basic requirement is response speed, i.e. it is expected that the obtained solutions are fast and high-quality. The combination of optimization and heuristic techniques, and the decision-maker's experience that describes different parts of an actual system provides a comprehensive instrument for obtaining satisfactory solutions to real-life problems [5].

The knowledge management subsystem can survive on its own, or be incorporated into another subsystem. What makes it special is the connection with the knowledge base, which enables the expertise of the problem being solved. The subsystem may incorporate expert systems, neural networks, intelligent systems, etc. Decision support systems that have a built-in knowledge management subsystem are known as "Knowledge Based – DSS", "Intelligent decision support systems – IDSS" or "DSS/ES – as a combination" [5].

This subsystem is in charge of the communication between DSS and the user. The user accessed the DSS through the user interface to obtain information necessary for decision-making. In order to use the interface as efficiently as possible, it is necessary to define display standards, use standardized and comprehensible terms and labels, enable interface parameters modification, easy navigation, etc. The user interface enables data entry, model creation and data display [5].

2.2 Data warehouse and dimensional model

The need for storing large amounts of data has made it necessary to store these data in a form that allows quick access. Relational databases in which data are organized into tables of interconnected relations are used most often. However, storing data in relational databases has certain limitations that are reflected in the impossibility to obtain quality and timely information for decision-making. Data are represented differently in different databases, the same data are sometimes labeled differently, so it is difficult to define queries for such databases. In addition, data is collected from different databases, which prolongs their processing and response time, and complicates the calculations, which in turn, slows down the decision-making process. Relational databases are frequently updated, so only the latest data is saved, and sometimes decision-making requires older data. For that reason, interesting data is collected and integrated into a unified system known as a data warehouse [7].

The so-called dimensional model is used for storing and structuring data in data warehouses. The dimensional model is a data model suitable for data analysis in decision-making. Data in the dimensional model are not normalized, i.e. they contain redundancies. In consequence, they occupy more memory, but also provide greater opportunities to use data for analytical purposes, and faster data access [7].

Data in a data warehouse can be represented in the form of a multidimensional structure known as the cube. There is also a new cube-based way of analyzing, easy and selective reporting and reviewing data known as OLAP (Online Analytical Processing, Figure 3) [7]. Software solutions that integrate all the main components necessary for data analysis are called Business Intelligence Platforms, Figure 3) [7].

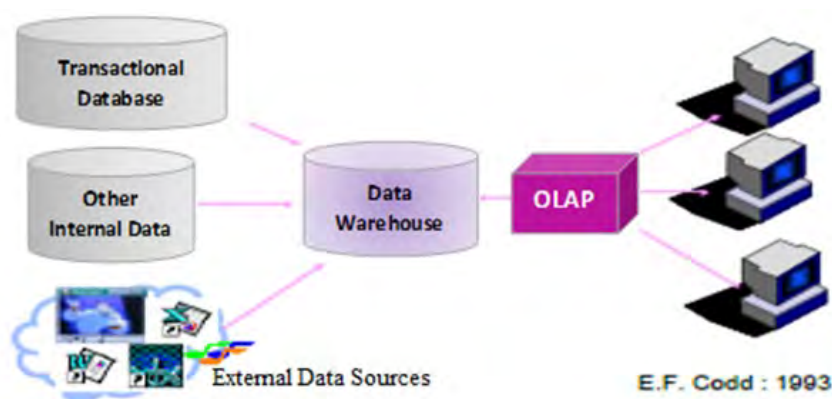


Figure 3. Business Intelligence [14]

The data storing procedure involves the following stages [7]:

- » Extraction, transformation and loading (ETL);
- » Data storage;
- » Use of data for decision-making purposes.

The most comprehensive and significant part is the extraction, transformation and loading process. The importance of this process involves the identification of data sources, and extraction of interesting data. This process takes the longest. These data are then consolidated, transformed and loaded into a data warehouse as needed. When storing data, things that should be taken into account are the possibility of fast and efficient access to data, as well as data security and durability [7]. The use of data is realized through queries on the data warehouse, report preparation, graphs, data analysis and identification of patterns in the data. There is a special technique for storing and manipulating data in the data warehouse optimized for analytical use thanks to a special query language, OLAP (Online Analytical Processing). This technique makes use of a crosstab query by rows and columns [7]. The technique of data mining is used for finding hidden, previously unknown facts within the data warehouse, which enable the discovery of future behaviors [7]. Relational databases have certain limitations that make it impossible to obtain sufficiently accurate data for decision-making, so database designers presented an easier-to-understand model, the so-called dimensional model [7]. Dimensional modeling is a technique of logical data modeling in a simple and intuitive form, which is easier to view. The dimensional model contains redundant data, because normal forms are not applied on it. Each model contains a table with a composite primary key – fact table and a group of smaller tables, i.e. the so-called dimension tables. Each dimension table contains a simple primary key that matches one of the attributes of the composite primary key of the fact table. This structure is known as a star schema (star join) (Figure 4) [7].

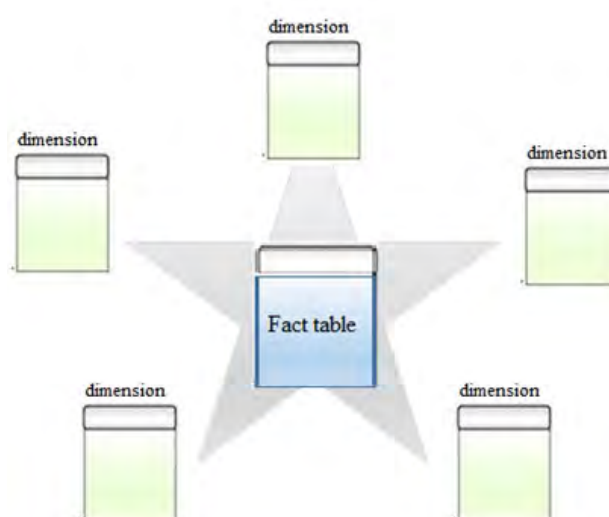


Figure 4. Star schema [15]

The fact table contains groups of numerical attributes:

- » Keys to dimension tables;
- » Dimensions.

Fact tables are normalized, or almost normalized. Dimensions are numerical attributes in a fact table, and they are added for each combination of foreign keys that define an entry; it is an assessment of the process monitored by the fact table, or measure of a phenomenon [7].

The architecture of a data warehouse is not predefined, but depends on the business itself. The following forms are the most common [7]:

- » as data sources - databases or multiple databases, files, web services; k
- » Data Staging Area is represented by a single database and used for data collection and transformation;
- » Operational Data Store in the form of database where users update data on a daily basis;
- » Data Warehouse, relational database management system;
- » OLAP, non-relational database management system, speeds up queries and additional analyses;
- » tools suitable for reviewing, analysis and visualization.

2.3. Importance of software support in emergency situations

Decision support systems have found their application in various crisis situations, because of their ability to [8]:

- » provide citizens with important information in crisis situations;
- » collect, store and process data from different information systems;
- » ensure coordination between different decision-makers;
- » predict the outcomes of the decisions made.

Emergency Medical Services - EMS, a crisis management information system was developed for the purpose of providing timely reactions in the health sector. It is a critical response database that provides real-time graphical information. Critical situations involve numerous obstacles to the integration and coordination of emergency actions in the health system [9]. The aim of this project was to develop a reliable and well-connected infrastructure. In addition, the project makes use of an intelligent, decision support system to improve business processes. The project involves: a completely computerized crisis management

system; computerized system for electronic reporting on patient care, and central monitoring system – operating room [8]. EMS also enables the identification and management of patients with critical infection conditions (i.e. severe respiratory tract infections, severe infections of the central nervous system (CNS), and sepsis) to the Specialized Emergency Department (ED) for infectious diseases. EMS is based on widely available technologies and tools, such as servers, Microsoft® operating system (OS), Oracle Database Management System (DBMS), Geographic Information System (GIS), Network Analyst and Tracking Analyst [9]. EMS has four main integrated system components: infrastructure, application, data and training (Figure 5) [9].

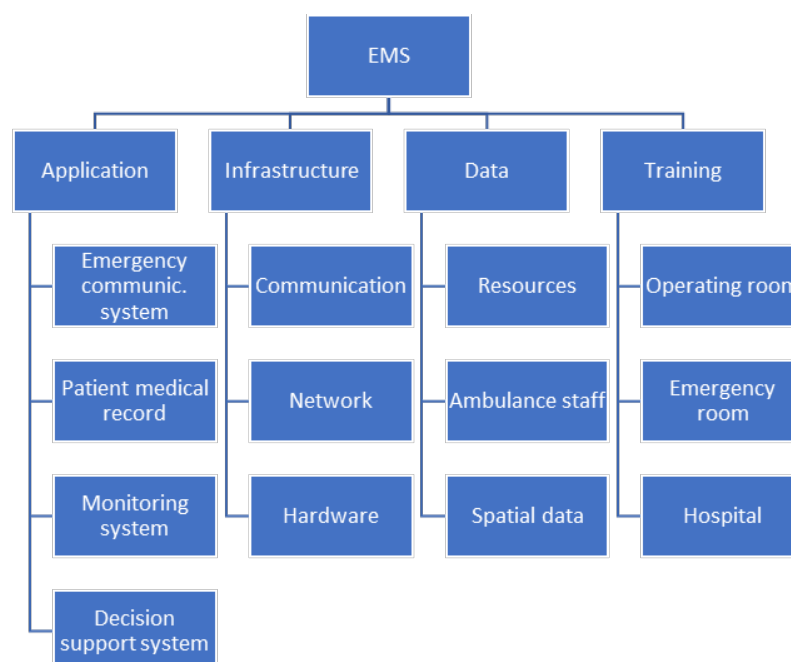


Figure 5. Emergency Medical Services – EMS

In the recent past, there have been several large-scale industrial catastrophes that have caused significant loss of human lives, and environmental damage. On December 3, 1984, 40 tons of toxic gas, methyl-isocyanate leaked from the chemical factory Union Carbide in Bhopal, India, killing at least 15,000 people and injuring another 150,000. A lesser known, but even more terrible incident occurred in the Chinese Henan province, where the collapse of the Banqiao and Shimantan Dams in 1975 during the typhoon Nina killed 26,000 people, while another 145,000 died as a result of the subsequent epidemics and famine. In that catastrophe, about six million buildings collapsed, and over 10 million people were affected. However, the industrial catastrophe that probably came closest to the apocalyptic visions of global devastation is the Chernobyl nuclear catastrophe that occurred in 1986 [6]. The world's largest nuclear disaster occurred on April 26, 1986 in the Chernobyl nuclear plant in Pripjat, Ukraine, which was still part of the USSR at the time. It is believed that the cause of the catastrophe was an experiment gone wrong that caused the reactor to explode. As there was no containment building on site, the radioactive content was released in the atmosphere, contaminating large areas of the USSR (especially Ukraine, Belarus and Russia), Eastern and Western Europe, Scandinavia, and the eastern seaboard of North America in the days and weeks following the accident [6].

Different, and often conflicting responses of different European countries after the Chernobyl disaster have made it clear that the European Union needed a comprehensive and unified response to nuclear emergencies. Funded by the European Commission through numerous research programs (the so-called framework programs), a group of universities and research institutions from Europe and the former USSR collaborated on the development of the Real-time Online Decision Support System or RODOS. RODOS was designed as support to emergency situations management after a nuclear disaster at all levels of society (local, regional and national) throughout Europe. RODOS aimed to [6]:

- » provide a common platform or framework for the integration of the best characteristics of the existing DSS and future development;
- » provides greater transparency in the decision-making process as one of the inputs aimed at improving public understanding and acceptance of emergency measures;
- » facilitate and improve communication between countries, as well as data monitoring, consequence prediction, etc. in case of a future disaster;
- » promote a more coherent, consistent and coordinated response to any future disaster that may affect Europe through system development and application.

RODOS DSS comprises three different subsystems, where each contains a series of modules [6]:

- » Analyzing Subsystem (ASY) modules process incoming data and process the location and quantity of contamination, including temporal variation. These modules contain meteorological, atmospheric and hydrological dispersions, precipitation and absorption, effects on health and other models. ASY modules predict situation development in line with the best scientific understanding of the processes involved;
- » Countermeasure Subsystem - CSI modules suggest possible countermeasures, check them for feasibility, and calculate their expected benefit in terms of a number of attributes;
- » Evaluation Subsystem - ESY modules rank countermeasure strategies according to their potential benefit and preference weights provided by decision-makers.

The correlation of all software modules, data entry, data transmission and exchange, result display and modes of operations (interactive and automatic) is controlled by the RODOS operating system, a layer built under the UNIX operating system of the mainframe. Interaction with users and data presentation occurs through a graphics subsystem which includes a purpose-built geographic information system (RoGIS). It displays demographic, topographic, economic and agricultural data, together with the contours of the measured and predicted radiological data. These outputs are there to ensure that results can

be used and understood by different users [6].

RODOS is a real-time network system connected to meteorological and radiological data networks, meaning that it comprises several communication modules. All data required by information processing modules are stored in databases, and RODOS includes three main categories [6]:

- » programs database that includes input and output data required or produced by different modules, intermediate and final results, provisional data, etc.;
- » real-time database that includes information from the regional or national radiological and meteorological networks;
- » geographical database that stores geographical and statistical data for the whole of Europe.

The system is designed to be flexible, so as to function equally well in different circumstances. Hence, the content of the subsystems and databases differ depending on the particular system application, i.e. nature and characteristics of any potential nuclear accident, different monitoring data, national regulations, etc. RODOS models and databases can be adapted to different site characteristics, as well as geographical, climatic and environmental variations throughout Europe. The current version of the RODOS system is installed in national emergency centers of Germany, Finland, Spain, Portugal, Austria, The Netherlands, Poland, Hungary, Slovakia, Ukraine, Slovenia and the Czech Republic. Other countries, such as Romania, Bulgaria, Russia, Greece, and Switzerland are considering the installation. As a result, RODOS is nowadays almost a centralized resource for all relevant information that may be needed in any potential nuclear crisis in the European Union [6].

ReliefWeb (<http://www.reliefweb.int>) is the world's leading network for information on humanitarian emergencies and disasters. The Office for the Coordination of Humanitarian Affairs (OCHA) provides information on emergency situations and natural disasters around the world from over 1,000 sources, including the UN, governments, non-governmental organizations (NGOs), academic community and media on ReliefWeb. This network publishes final reports, documents and reports from humanitarian partners, providing a global repository of information on emergency reactions in one place [9]. Regional Information Networks (IRIN) collects information from various humanitarian and other sources, providing context and reporting on emergency situations and countries at risk [6]. Information Management Units (IMU) and Humanitarian Information Centers (HIC) collect, manage and disseminate operational data and information from the field, providing geographic information products and a collection of operational databases and related content to decision-makers both in the field, and at headquarters [6]. VISTA is an example of a new web-based visualization tool, which not only provides information about the situation, but allows humanitarian analysis of the situation as well [6].

Sahana is a web-based collaboration platform that addresses common coordination problems during catastrophes related to missing persons, aid management, volunteer management, relocation monitoring, etc. between government groups, civil society (NGOs) and victims themselves. Sahana is a web-based, integrated set of applications for catastrophe management that provides solutions for major humanitarian problems following a disaster. The main applications and problems they address are the following [6]:

- » Register of missing persons: Helping to reduce trauma by efficiently finding missing persons;
- » Register of organizations: Coordinating and balancing the distribution of aid organizations in the affected areas, connecting relief groups and helping them to act in coordination;
- » Request management system: Registering and monitoring all incoming requests for aid until fulfillment, and aiding donors to respond to requests for aid;
- » Register of camps: Monitoring the location and number of victims in various camps and temporary shelters throughout the affected area.

The development of Sahana, a free open-source code for disaster management was triggered by the 2004 tsunami, to help coordinate aid efforts in the affected Sri Lanka. It was originally developed by a group of volunteers from the IT industry of Sri Lanka, led by Lanka Software Foundation. The application of Sahana was approved and implemented by CNO (the main Sri Lankan government body for coordinating relief efforts) to help coordinate all data collected. For the purposes of global implementation and adequate response to large-scale catastrophes, the work aimed at improving the Sahana system is still ongoing. Sahana was successfully used after several other natural disasters, for example the major earthquake in Pakistan in 2005, storm in the Philippines and the earthquake in Yogyakarta, both in 2006. Sahana's long-term goals are to develop into a comprehensive disaster management system, including mitigation, preparation, aid and recovery [6].

5. Conclusion

Uncertainty and rapid changes in the environment are among the main features of any crisis situation. As such, crisis situations create discontinuity in the functioning of business systems, pose a threat to human lives and disrupt development, both on a local and global level [10].

Making timely decisions in such situations is directly related to the ability to access real data. Innovations in the field of information and communication technologies have led to the development of decision support systems that enable us to collect, process and spatially present data related to the given crisis situation, which allows decision-makers to consider and monitor the situation in real-time, as well as to react in a timely manner [11].

References

1. Worldometers. Coronavirus cases. [Internet]. 2020. Available from: <https://www.worldometers.info/coronavirus/>
2. Sheng J, et al. COVID/19 pandemic in the new era of big data analytics: Methodological innovations and future research directions. *British Journal of Management*; 2021. 32.4: pp. 1164–1183.
3. Wu L, Hitt L, Lou B. Data analytics, innovation, and firm productivity, *Management Science*; 2020. 66: pp. 1783–2290.
4. Lurie NH, Swaminathan JM. Is timely information always better? The effect of feedback frequency on decision making. *Organizational Behavior and Human decision processes*; 2009. 108.2: pp. 315–329.
5. Mišković V. *Sistemi za podršku odlučivanju*. Prvo izdanje. Beograd: Univerzitet Singidunum; 2013.
6. Van de Vale B, Turof M. Decision support for emergency situation <https://link.springer.com/article/10.1007/s10257-008-0087-z>
7. Milić M. *Odlučivanje i poslovna inteligencija*. Banja Luka: Univerzitet za poslovni inženjering i menadžment; 2014.
8. Fertier A, et al. A new emergency decision support system: the automatic interpretation and contextualisation of events to model a crisis situation in real-

- time. Decision Support Systems; 2020. 133: 113260.
9. Internet, dostupno na: <https://www.fema.gov/disaster/1603>
10. Nikolić, M. Uloga informacionih sistema u katastrofama: The role of information systems in disaster. Zbornik radova – Taktika zaštite i spasavanja u vanrednim situacijama, Beograd; 2021. 1.1: pp. 163–175.
11. Knežević J. Završni rad „Značaj softverske podrške pri donošenju poslovnih odluka u uslovima pandemije“. Beograd: Visoka škola strukovnih studija za informacione tehnologije – ITS.
12. Mišković V. Sistemi za podršku odlučivanju. Beograd: Univerzitet Singidunum; 2013. str. 5.
13. Živadinović J. Menadžment informacioni sistemi, PEP Beograd; 2013. str. 40. Dostupno na: <https://scindeks-clanci.ceon.rs/data/pdf/2334-816X/2014/2334-816X1402033M.pdf> (posećeno 18. 9. 2020).
14. Pantelić O. Analitička obrada podataka. Beograd: Fakultet organizacionih nauka; 2016. slajd 6.
15. Mekterović I, Brkić Lj. Skripta – Skladišta podataka i poslovna inteligencija. 2017. str. 14.

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Primena ishoda učenja u nastavnom procesu visokog obrazovanja na ITS-u

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Rezime: U radu je prvo ukratko rezimiran pojam i značaj ishoda učenja. Zatim su dati podaci o pojmu ishodi učenja u Zakonu o visokom obrazovanju i Zakonu o nacionalnom okviru kvalifikacija, kao i standardima akreditacije u visokom obrazovanju i standardima i uputstvu za samovrednovanje visokoškolskih ustanova i studijskih programa Republike Srbije i uputstvu recenzentskoj komisiji za procenu ispunjenosti standarda. Nakon toga su navedene aktivnosti preduzete u Visokoj školi strukovnih studija za informacione tehnologije (skraćeni naziv ITS, od naziva na engleskom Information Technology School) u primeni ishoda učenja u nastavnom procesu. Dati su i rezultati ankete dve generacije studenata o korisnosti ishoda učenja, koji potvrđuju opravdanost njihove primene na nivou nastavnog časa.

Ključne reči: kvalitet; visoko obrazovanje; ishodi učenja; nastavni čas.

1. Uvod

Ishodi učenja (engl. learning outcomes) primenjuju se kao metod povećanja kvaliteta u visokom obrazovanju u Evropi i svetu [1].

Ishodi učenja se najčešće definišu kao jasni opisi onoga što bi student trebalo da zna, razume i ume da uradi po završetku učenja [1, 2]. U skladu sa ishodima učenja formiraju se studijski programi, studijski predmeti, časovi predavanja, vežbi, njihov sadržaj, nastavni materijal, metode predavanja, metode učenja, način provere postignutog znanja itd. Iskustvo i u Visokoj školi strukovnih studija za informacione tehnologije je pokazalo da definisani i saopšteni ishodi učenja pomažu studentima u izboru i savladavanju studijskih programa i predmeta. Prema standardima akreditacije u visokom obrazovanju, definisanje ishoda učenja studijskih predmeta predstavlja obavezu.

Realizacija ishoda učenja zahteva od studenta i samostalan rad, a sve to je osnova za dobijanje dodeljene vrednosti Evropskog sistema prenosa bodova (ESPB) odgovarajućem studijskom predmetu [3].

Dobro napisani ishodi učenja treba da sadrže glagol koji ukazuje šta se očekuje da će student biti u stanju nakon završetka ciklusa učenja. Spisak takvih glagola treba uskladiti sa Blumovom taksonomijom nivoa saznanja [1].

U radu je u uvodu ukratko rezimiran pojam i značaj ishoda učenja, zatim je navedeno gde se u zakonima i standardima akreditacije u Republici Srbije spominje pojam ishodi učenja, a nakon toga su navedene aktivnosti preduzete u Visokoj školi strukovnih studija za informacione tehnologije (VŠSSIT) u primeni ishoda učenja u nastavnom procesu i dati rezultati ankete dve generacije studenata o korisnosti ishoda učenja, sprovedene u istoj ustanovi, uz osnovne zaključke koji proizlaze iz njenih rezultata i preporuke nastavnicima.

2. O ishodima učenja u zakonima i standardima akreditacije u Republici Srbiji

Kada se radi o Republici Srbiji, ishodi učenja se kao pojam spominju u Zakonu o visokom obrazovanju Republike Srbije, Zakonu o nacionalnom okviru kvalifikacija i podzakonskim aktima, kao što su „Standardi i uputstva za akreditaciju studijskih programa prvog i drugog stepena“, „Standardi i uputstva za akreditaciju visokoškolskih ustanova (fakultet, visoka škola i visoka škola strukovnih studija)“, „Standardi i uputstva za samovrednovanje i ocenjivanje kvaliteta visokoškolskih ustanova i studijskih programa“ i „Uputstva recenzentskoj komisiji za procenu ispunjenosti standarda za akreditaciju studijskih programa prvog i drugog stepena visokog obrazovanja“, što sve ukazuje na značaj koji im je dat.

U Zakonu o visokom obrazovanju Republike Srbije [4] ishodi učenja se spominju u 4 člana: 34, 38, 132 i 154:

- » U članu 34, koji se odnosi na vrste studija, u stavu 4 kaže se: „Radi stručnog osposobljavanja lica sa stečenim visokim obrazovanjem za uključivanje u radni proces, izvodi se kratki program studija koji ima jasno definisanu strukturu, svrhu i ishode učenja i za koji se izdaje sertifikat o završenom kratkom programu studija i stečenim kompetencijama.“
 - » U članu 38, koji se odnosi na sadržaj studijskog programa, u tački 3, pored ostalog, navodi se da se studijskim programom utvrđuju „ishodi procesa učenja u skladu sa zakonom koji utvrđuje nacionalni okvir kvalifikacija“.
 - » U članu 132, koji se odnosi na priznavanje strane visokoškolske isprave radi nastavka obrazovanja, u stavu 2 se kaže: „U postupku iz stava 1 ovog člana nastavak obrazovanja i upis višeg obrazovnog stepena mogu biti uslovljeni obavezom sticanja dodatnih ishoda učenja ili odbijeni ako se utvrdi postojanje suštinske razlike između vrste i nivoa postignutih znanja i veština i uslova za upis na određeni studijski program.“
 - » U članu 154 piše da će do donošenja Zakona o nacionalnom okviru kvalifikacija (koji je u međuvremenu usvojen) visokoškolske ustanove utvrđivati ishode procesa učenja iz člana 38, tačka 3 Zakona o visokom obrazovanju u skladu sa propisima koji su doneti do stupanja na snagu ovog zakona.
- U Zakonu o nacionalnom okviru kvalifikacija [5] ishodi učenja se spominju u članovima 2, 3, 4, 6 i 22:
- » U članu 2, „Osnovni pojmovi i njihovo značenje“, definišu se pojmovi kvalifikacija (u kojem se spominje pojam ishodi učenja) i ishodi učenja:

- » „Kvalifikacija – formalno priznanje stečenih kompetencija. Pojedinaac stiče kvalifikaciju kada nadležno telo utvrdi da je dostigao ishode učenja u okviru određenog nivoa i prema zadatom standardu kvalifikacije, što se potvrđuje javnom ispravom (diplomom ili sertifikatom).“
- » „Ishodi učenja – jasni iskazi o tome šta se od pojedinca očekuje da zna, razume i da je sposoban da pokaže, odnosno uradi nakon završenog procesa učenja. Omogućavaju proverljivost nivoa razvijenosti kompetencija, odnosno dostignutosti znanja, veština, stavova i sposobnosti.“
- » U članu 3, „Ciljevi NOKS-a“, treći cilj se odnosi na ishode učenja i kaže: „Obezbeđivanje orijentisanosti celokupnog obrazovanja na ishode učenja kojima se izgrađuju kompetencije definisane standardom date kvalifikacije.“
- » U članu 4, „Principi NOKS-a“, deveti princip je „Obezbeđivanje kvaliteta – upravljanje procesom razvoja kvalifikacija na osnovu standarda i ishoda učenja, kao i sistemom kvaliteta u procesu sticanja i vrednovanja kvalifikacija.“
- » U članu 6, „Deskriptori nivoa kvalifikacija“, navodi se: „Za svaki nivo i podnivo kvalifikacija iz člana 5 ovog zakona utvrđeni su deskriptori neophodni za obavljanje posla ili dalje učenje. Kvalifikacije se razvrstavaju po nivoima na osnovu složenosti ishoda učenja.“
- » U članu 22, „Nadležnost Sektorskog veća“, navodi se da Sektorsko veće „daje mišljenje o očekivanim ishodima znanja i veština unutar sektora“.

U dokumentima koji se odnose na standarde akreditacije pojam ishodi učenja se spominje u dva dokumenta:

- » „Standardi i uputstva za akreditaciju studijskih programa prvog i drugog stepena“,
- » „Standardi i uputstva za akreditaciju visokoškolskih ustanova (fakultet, visoka škola i visoka škola strukovnih studija)“.

U dokumentu „Standardi i uputstva za akreditaciju studijskih programa prvog i drugog stepena“ [6], ishodi učenja se pojavljuju u sledećim standardima:

- » Standard 1. Struktura studijskog programa,
- » Standard 4. Kompetencije diplomiranih studenata,
- » Standard 5. Kurikulum,
- » Standard 15. Studije na daljinu.

U dokumentu „Standardi i uputstva za akreditaciju visokoškolskih ustanova (fakultet, visoka škola i visoka škola strukovnih studija)“ [7] ishodi učenja se pojavljuju u sledećim standardima:

- » Standard 4: Studije,
- » Standard 13: Javnost u radu.

U dokumentu „Standardi i uputstva za samovrednovanje i ocenjivanje kvaliteta visokoškolskih ustanova i studijskih programa“ [8] ishodi učenja se pojavljuju u sledećim standardima:

- » Standard 4: Kvalitet studijskog programa,
- » Standard 5: Kvalitet nastavnog procesa,
- » Standard 8: Kvalitet studenata.

U standardu 4 pojam ishodi učenja pojavljuje se veliki broj puta.

U dokumentu „Uputstva recenzentskoj komisiji za procenu ispunjenosti standarda za akreditaciju studijskih programa prvog i drugog stepena visokog obrazovanja“ [9] ishodi učenja se pojavljuju u sledećim standardima:

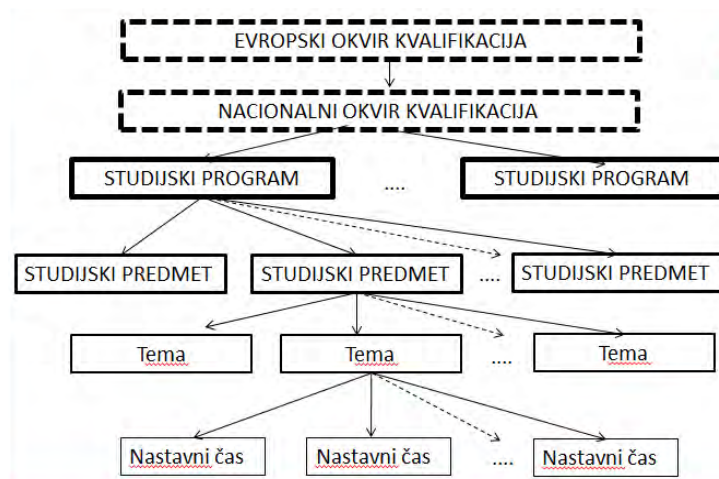
- » Standard 1. Struktura studijskog programa,
- » Standard 4. Kompetencije diplomiranih studenata,
- » Standard 5. Kurikulum,
- » Standard 15. Studije na daljinu.

Ishodi učenja se spominju i u drugim dokumentima za recenzente, ali ih ovde nećemo detaljno navoditi.

Ishodi učenja se mogu definisati za neku naučnu disciplinu na svim nivoima: svetski nivo, regionalni nivo, državni nivo, nivo obrazovanja, studijski program, studijski predmet, nastavna jedinica i nastavni čas (slika 1). Međutim, u Republici Srbiji, prema zahtevima dokumenta „Standardi i uputstva za akreditaciju studijskih programa prvog i drugog stepena“, obavezno ih je definisati na nivou studijskog predmeta. Takođe, u izveštaju o samovrednovanju se zahteva mapiranje predmeta prema ishodima učenja. Logično, trebalo bi to mapiranje obaviti prema ishodima učenja studijskog programa, ali kada se radi o studijskim programima, u standardima se ne govori o ishodima učenja, već o kompetencijama.

Usvajanjem Zakona o nacionalnom okviru kvalifikacija, gde se koristi termin kvalifikacija, koje treba da su u vezi sa ishodima učenja, Srbija je nacionalni okvir povezala sa Evropskim okvirom kvalifikacija.

U dokumentima akreditacije se o ishodima učenja ne govori na drugim nivoima, osim na nivou predmeta i studijskih programa (kod studijskih programa se govori o kompetencijama), ali je logično da nastavnik koji realizuje predmet, na osnovu ishoda učenja za predmet, definiše ishode učenja i za svaki nastavni čas.



Slika 1. Struktura ishoda učenja

3. O primeni ishoda učenja na ITS-u

U Visokoj školi strukovnih studija za informacione tehnologije – ITS ishodima učenja se poklanja velika pažnja od 2010. godine, ubrzo nakon prve akreditacije 2007. godine. Napisani su ishodi učenja za studijske programe i studijske predmete, što je obaveza u pripremi za akreditaciju. Kod izrade izveštaja o samovrednovanju 2012. godine obavljeno je mapiranje svih predmeta (obaveznih i izbornih) prema kategorijama kompetencija (opšte, predmetno specifične), koji su smatrani za ishode učenja, za studijske programe Informacione tehnologije (IT) i Elektronsko poslovanje (EP), a 2014. godine i za nove studijske programe Organizacija poslovnih sistema (OPS) i Računarska multimedija (RM), što je obaveza prema uputstvima za samovrednovanje.

Da bi taj proces bio u potpunosti realizovan, smatrali smo da sa pisanjem (a i primenom) ishoda učenja treba nastaviti i dalje, preko nastavnih tema do pojedinačnog nastavnog časa. Podrazumeva se da ishodi učenja časa treba da budu u vezi sa ishodima teme, a teme sa ishodima predmeta, a predmeta sa ishodima studijskog programa. Prema tome, trebalo ih je razraditi sa nivoa studijskog programa i predmeta do nivoa nastavnog časa.

Zbog toga su od studijske 2013/2014. godine za svaku nastavnu jedinicu (koja odgovara jednom času od 45 minuta), prvo za predmet Informacione i internet tehnologije, a zatim Računarske mreže i Pouzdanost informacionih sistema, napisani ishodi učenja (7–10 ishoda za svaki čas), koji su studentima saopštavani na početku svakog časa za taj čas.

Zbog značaja koji je dat primeni ishoda učenja u nastavnom procesu, kako bi se ovakav pristup proširio i na ostale predmete studijskih programa, organizovane su radionice za nastavnike posvećene pisanju ishoda učenja, a zatim i ocenjivanju u skladu sa ishodima učenja. O značaju ishoda učenja je pisano i na blogu („Student, ne nastavnik, u centru obrazovnog procesa“, decembra 2013. godine [10], a marta 2016. godine blog pod naslovom „Ishodi učenja = šta će biti na ispitu?“ [11]).

Potrebu za primenom ishoda učenja prepoznali su i drugi, pa je na poziv održano predavanje na Konferenciji akademija strukovnih studija 2016. godine, a prezentacija se može videti na internet adresi [12]).

4. Primena ishoda učenja u nastavnom času na ITS-u

Kao što je već napomenuto, i za svaki nastavni čas napisani su ishodi učenja za predmete Informacione i internet tehnologije, Računarske mreže i Pouzdanost informacionih sistema i primenjeni u nastavi u toku celog semestra. Nakon toga su za predmet Informacione i internet tehnologije o tome anketirani studenti u dve uzastopne studijske godine, odnosno dve generacije studenata.

Studenti su motivisani da koriste napisane ishode učenja u predmetu Informacione i internet tehnologije, tako što su na početku svakog časa u prezentaciji dati napisani ishodi učenja za taj čas, a na kraju prezentacije je dat određen broj pitanja, kojima se deo tih ishoda učenja proverava. U ishodima učenja piše 7–10 ishoda, a u pitanjima za proveru znanja na kraju svake nastavne jedinice ima obično 5 pitanja, pa nisu svi ishodi obuhvaćeni tim pitanjima.

Dakle, polazeći od ishoda učenja datih na početku nastavnog časa (nastavne jedinice), student može da identifikuje koji su ishodi učenja obuhvaćeni pitanjima za proveru znanja na kraju časa, a koji nisu.

Kod provere znanja, odnosno postignutosti ishoda učenja na testu, kolokvijumima i/ili ispitu daje se 70% pitanja od pitanja koja su data na kraju nastavnih jedinica kao pitanja za proveru znanja, ali i 30% novih pitanja koja su iz sadržaja tih nastavnih jedinica. Iz kojih će sadržaja nastavnih jedinica biti tih 30% pitanja studenti mogu zaključiti na osnovu ishoda učenja, pa se time motivišu šta da uče, šta će biti proveravani, odnosno šta se od njih očekuje da znaju, a poznato je da studenti uče upravo ono što očekuju da će biti na ispitu.

Iskustvo pokazuje da se može smatrati pravilom da će studenti učiti ono što veruju ili očekuju da će biti predmet provere znanja, a ne ono što spada u nastavni program, pa čak ni ono što je obrađeno na predavanjima [13, 14]. Prema tome, zašto da im jasno ne damo informaciju o tome šta se očekuje da nauče, a uostalom to i jeste definisano ishodima učenja studijskog predmeta (kao obaveza po standardima akreditacije). Samo to treba još sprovesti u realizaciji svakodnevne nastave, odnosno definisati i za svaki nastavni čas.

Prema tome, student koji je upoznat sa ishodima učenja ima jasnu predstavu o tome šta ga očekuje na proveri znanja (kolokvijumi, završni ispit itd.).

Naravno, to zahteva dodatnu aktivnost, odnosno napor od nastavnika. Treba da dobro poznaje ishode učenja predmeta, koji su definisani za predmet u toku akreditacije. Zatim ih treba konzistentno razraditi za svaku temu, a zatim nastavni čas. O tome kako pisati ishode učenja postoje brojne preporuke, na primer u [13, 14]. Navedimo samo neke radi ilustracije: započeti svaki ishod učenja sa aktivnim glagolom; koristiti samo jedan glagol za svaki ishod učenja; izbegavati neoperativne pojmove kao znati, razumeti, naučiti, biti upoznat sa, biti svestan, jer oni više ukazuju na ciljeve nego ishode učenja; moraju biti jasni i merljivi; moraju biti takvi da se mogu oceniti (proveriti njihova postignutost); da li se mogu postići za planirano vreme itd.

S druge strane, definisani ishodi učenja [13, 14] pomažu nastavnicima da preciznije kažu studentima šta se od njih očekuje; da odaberu odgovarajuće metode nastave usklađene sa ishodom učenja; uspostave odgovarajuće načine provere znanja u skladu sa ishodima učenja, efikasnije urade nastavni materijal, jer im ishodi služe kao vodič itd. Ako postoje napisani ishodi učenja za svaki nastavni čas i postoje pitanja za proveru znanja za taj nastavni čas, lakše je utvrditi da li se zaista pitanjima proverava usvojenost sadržaja nastavnog časa predviđenih ishodima učenja.

Nastavnici nisu anketirani, a smatramo da bi bilo korisno saznati i njihove stavove. Kratak uvid u materijale sa nastave slučajno izabranih nastavnika pokazao je da skoro polovina nastavnika nije usvojila pristup da studentima saopštavaju ishode učenja za svaki nastavni čas, a i među onima koji to rade pristup nije jedinstven ili ishodi učenja nisu pravilno definisani. Prema tome, postoje razlozi da se nastavi sa radionicama koje osposobljavaju nastavnike i motivišu ih na realizaciju nastave kroz unapred definisane ishode učenja za svaki nastavni čas.

Da bi se proverilo kako su studenti razumeli i prihvatili nastavu gde su za svaki nastavni čas definisani i saopšteni ishodi učenja, urađena je i sprovedena jednostavna anonimna anketa u dve generacije studenata.

5. Rezultati ankete studenata o primeni ishoda učenja u nastavi na ITS-u

Anketa studenata je sprovedena 2016. i 2017. godine kod dve generacije studenata prve godine, na predmetu Informacione i internet tehnologije na ITS-u u Beogradu, na kraju realizacije 2. kolokvijuma [15–18].

U 2016. godini anketu su radila 132 studenta, a 2017. godine njih 150. Oba puta u anketi su bila ista 4 pitanja, a prvo

pitanje je bilo o tome da li je student polagao i položio 1. kolokvijum. Na ovom predmetu je visok procenat studenata koji polože oba kolokvijuma (između 80% i 90%).

Rezultati ankete na ostala 3 pitanja koja su u vezi sa ishodima učenja sumirani su u tabeli 1, tako što su dati uporedo podaci, prvo za anketu 2016/2017. godine.

Brojčani rezultati u tabeli 1 pokazuju da ukupno oko 90% studenata u obe generacije smatra da su im ishodi učenja u potpunosti ili delimično pomogli, iako ima razlika.

Procenat studenata koji navode da nikako nisu koristili ishode učenja manji je od 10%.

Kada se radi o identifikaciji 30% pitanja kojih nema na kraju nastavnih jedinica, a daju se na kolokvijumima i ispitima, situacija je slična.

Na pitanje „Da li smatrate da je korisno da imate napisane ishode učenja za predmet, na osnovu kojih znate šta se od vas očekuje da naučite, a to će biti na ispitu“, godine 2017. je za oko 4% više studenata odgovorilo potvrdno – 84,67% (prethodne godine 78,79%), a samo 0,7% (prethodne godine 3%) odrečno, dok 14,67% (prethodne godine 18,18%) nije imalo o tome određen stav.

U celini, rezultati ankete na značajnom uzorku (oko trećine ukupnog broja prve godine svih studijskih programa, odnosno tri četvrtine studenata studijskog programa Informacione tehnologije) pokazuju da studenti koriste ishode učenja (ako ih imaju napisane za nastavne jedinice, odnosno nastavni čas), da su im pomogli oko toga šta treba da uče, odnosno šta se očekuje da znaju i šta će biti proveravani na ispitu. Takođe, 2017. godine u većem procentu smatraju korisnim da imaju napisane ishode učenja za predmet na osnovu kojih će znati šta se od njih očekuje da nauče, a da će biti na ispitu, što znači da uviđaju značaj i korisnost ishoda učenja.

R. br.	Pitanje	Broj odgovora	% odgovora	% odgovora
1	Ishode učenja napisane za predmet koristio/-la sam:			
	a) u potpunosti	55/41	41,98/27,52	90,83/88,59
	b) delimično	64/91	48,85/61,07	
	c) nikako	12/11	9,16/7,38	
		131/149		
2	Ishodi učenja, u identifikaciji 30% pitanja kojih nema na kraju nastavnih jedinica, a daju se na kolokvijumima i ispitima:			
	a) veoma su mi pomogli	62/58	48,06/36,25	93,8/88,25
	b) delimično su mi pomogli	59/78	45,74/52	
	c) nisu mi uopšte pomogli	8/14	6,2/9,33	
		129/150		
3	Da li smatrate da je korisno da imate napisane ishode učenja za predmet, na osnovu kojih znate šta se od vas očekuje da naučite, a to će biti na ispitu?			
	a) Da.	104/127	78,79/84,67	
	b) Ne.	4/1	3,03/0,7	
	c) Svejedno mi je.	24/22	18,18/14,67	
		132/150		

Tabela 1. Odgovori studenata na pitanja u anketi u vezi sa ishodima učenja (podaci u obliku 2016/2017. godina) [18]

6. Zaključak

Ishodi učenja su uvedeni u zakone (o visokom obrazovanju i nacionalnom okviru kvalifikacija) i standarde akreditacije i samovrednovanja visokoškolskih ustanova i njihovih studijskih programa i prihvaćeni kao metod povećanja kvaliteta u visokom obrazovanju. Zakonima i standardima akreditacije i samovrednovanja obavezane su visokobrazovne institucije da ih primenjuju. Kako u visokoobrazovnim institucijama ključnu ulogu imaju nastavnici, od suštinske je važnosti da oni poznaju suštinu ishoda učenja i primenjuju ih u nastavnom procesu ne samo na nivou studijskog programa već i na nivou nastavnog časa, dakle da budu u potpunosti sprovedeni u celokupnom procesu nastave. Zbog toga je u Visokoj školi strukovnih studija za informacione tehnologije preduzeto više aktivnosti (mapiranje predmeta prema ishodima studijskih programa, pisanje ishoda učenja za nastavni čas pojedinih predmeta, radionice za nastavnike i saradnike u vezi sa pisanjem ishoda učenja i ocenjivanjem na ispitu u skladu sa ishodima učenja).

Obavljene ankete studenata o korišćenju ishoda učenja napisanih za svaki nastavni čas odgovarajućeg predmeta pokazale su da studenti koriste saopštene ishode učenja, da su im oni pomogli oko toga šta se očekuje da znaju i šta će biti proveravani na ispitu, odnosno šta treba da uče. Takođe, studenti smatraju korisnim da imaju napisane ishode učenja za pojedini predmet na osnovu kojih će znati šta se od njih očekuje da nauče.

Ovde su anketirani samo studenti, ali bi bilo korisno anketirati nastavnike i saznati i njihove stavove, iskustva i probleme u realizaciji nastave kroz ishode učenja. Uvid u materijale sa nastave slučajno izabranih nastavnika pokazao je da neki nastavnici nisu usvojili pristup da studentima saopštavaju ishode učenja za svaki nastavni čas.

Reference

1. Pokorni S., Kuleto V. Kvalitet obrazovanja u Visokoj školi strukovnih studija za informacione tehnologije. 15. međunarodna konferencija „Upravljanje kvalitetom i pouzdanošću ICDQM-2012“, Zbornik radova, pp 24–33, Beograd, 28–29. jun 2012. (plenarno saopštenje)
2. Pokorni S. Student, ne nastavnik, u centru nastavnog procesa. [Internet] Available from: <https://www.its.edu.rs/2013/12/17/student-ne-nastavnik-u-centru-obrazovnog-procesa/>
3. Pokorni S. Ishodi učenja = šta će biti na ispitu. [Internet] Available from: <https://www.its.edu.rs/2016/03/25/ishodi-ucenja-sta-ce-biti-na-ispitu/>
4. Pokorni S. Ishodi učenja. [Internet] Available from: <https://slidetodoc.com/ishodi-ucenja-prof-dr-slavko-pokorni-slavko-pokorniits/>
5. Kennedy D. Pisanje i upotreba ishoda učenja, praktični vodič, 2. izdanje, Tempus kancelarija u Srbiji, Pintor Project; 2007.
6. Pokorni S. Analiza ankete studenata o ishodima učenja predmeta Informacione i internet tehnologije, Visoka škola strukovnih studija za informacione tehnologije, Beograd; 2016.
7. Pokorni S. Analiza ankete studenata o ishodima učenja predmeta Informacione i internet tehnologije, Visoka škola strukovnih studija za informacione tehnologije, Beograd; 2017.
8. Pokorni S., Kuleto V. Ishodi učenja u Visokoj školi strukovnih studija za informacione tehnologije, 19. međunarodna konferencija Upravljanje kvalitetom i pouzdanošću ICDQM-2016, Zbornik radova, 29–30. jun 2016. pp 118–122.
9. Pokorni S., Kuleto V., Ristić B. Primena ishoda učenja u nastavnom procesu, Informacione tehnologije, obrazovanje i preduzetništvo, ITOP18, Zbornik radova, Čačak (od 24. do 25. 3. 2018), str. 29–34, COBISS.SR-ID259599372, uvodni referat
10. European Commission. European credit transfer and accumulation system (ECTS): Key features. Luxembourg: Office for Official Publications of the European Communities; 2004. ISBN 92-894-4742-7 [Internet] Available from: https://www.udg.edu/ca/portals/5/come/ECTS_en.pdf
11. Cedefop. Defining, writing and applying learning outcomes. A European handbook. Luxembourg: Publications Office of the European Union; 2017. <https://op.europa.eu/en/publication-detail/-/publication/5f2ecb9c-dfbb-11e7-9749-01aa75ed71a1/language-en>
12. Zakon o visokom obrazovanju Republike Srbije. Službeni glasnik Republike Srbije, br. 88/2017, 73/2018, 27/2018 – dr. zakon, 67/2019, 6/2020 – dr. zakoni, 11/2021 – autentično tumačenje, 67/2021 i 67/2021 – dr. zakon. [Internet] Available from: https://www.paragraf.rs/propisi/zakon_o_visokom_obrazovanju.html
13. Zakon o nacionalnom okviru kvalifikacija, Službeni glasnik Republike Srbije, br. 27/2018 i 6/2020. [Internet] Available from: <https://www.paragraf.rs/propisi/zakon-o-nacionalnom-okviru-kvalifikacija-republike-srbije.html>
14. Kennedy D. Writing and Using Learning Outcomes, A Practical Guide. Quality Promotion Unit, UCC. 2007 [Internet] Available from: <https://www.cmepius.si/wp-content/uploads/2015/06/A-Learning-Outcomes-Book-D-Kennedy.pdf>
15. Pravilnik o standardima i postupku za akreditaciju studijskih programa. Standardi i uputstva za akreditaciju studijskih programa prvog i drugog stepena. Nacionalni savet za visoko obrazovanje. 25. 2. 2019. [Internet] Available from: <https://www.nat.rs/pravilnici/>
16. Pravilnik o standardima i postupku za akreditaciju visokoškolskih ustanova. Standardi i uputstva za akreditaciju visokoškolskih ustanova (fakultet, visoka škola i visoka škola strukovnih studija). Nacionalni savet za visoko obrazovanje. 28. 1. 2019. [Internet] Available from: <https://www.nat.rs/pravilnici/>



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Application of learning outcomes in the teaching process in higher education at ITS

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Summary: The paper first summarizes the concept and importance of learning outcomes, and then presents data on the said concept as defined in the Law on Higher Education, Law on the National Qualifications Framework of the Republic of Serbia, as well as the accreditation standards for higher education, standards and guidelines for self-evaluation of higher education institutions and study programs in the Republic of Serbia, and finally, instructions for review committees for assessing compliance with standards. Second, the paper lists the activities undertaken at the Information Technology School - ITS to apply learning outcomes in the teaching process, as well as the results of a survey conducted on two generations of students on the usefulness of learning outcomes, which justify their application at school period/class level.

Key terms: quality, higher education, learning outcomes, school period/class.

1. Introduction

Learning outcomes are implemented as a method for increasing the quality of higher education in Europe and the world [1].

They are commonly defined as statements that describe the knowledge or skills a student should acquire by the end of a particular assignment, class, course or program [1, 2]. Study programs, courses, lessons, exercises, teaching content, teaching material, teaching methods, learning methods, assessment methods, etc. are formed in line with the learning outcomes. Our experience at the Information Technology School shows that clearly defined and communicated learning outcomes help students in choosing and mastering study programs and courses. According to the accreditation standards for higher education, educational institutions are obligated to define learning outcomes for each course/subject..

Fulfilling learning outcomes demands independent student work, among other things, and all that is the basis for assigning an appropriate ECTS (European Credit Transfer System) value to a course [3].

Well-defined learning outcomes should contain a verb that describes expectations from a student after completing a learning cycle (what he/she knows/is able to do). The list of these verbs should be harmonized with Bloom's taxonomy of learning objectives [1].

The paper briefly summarizes the concept and importance of learning outcomes, listing all the laws and accreditation standards in Serbia where the concept is mentioned, as well as activities undertaken at the Information Technology School to apply learning outcomes in the teaching process, and finally, presents the results of a survey conducted in the same institution on two generations of students on the usefulness of learning outcomes, and basic conclusions arising from its results, and recommendations for teachers.

2. Learning outcomes in the laws and accreditation standards of the Republic of Serbia

With regard to the Republic of Serbia, learning outcomes as a concept are mentioned in the Law on Higher Education, Law on the National Qualifications Framework, and bylaws, such as Standards and Instructions for Accreditation of the First and Second Level of Higher Education, Standards and Instructions for Accreditation of Higher Education Institutions (faculties, colleges, and vocational colleges), Regulation on Standard for Self-evaluation and Quality Assessment of Higher Education Institutions and Study Programs, and Instructions for Review Commission for the Assessment of the Fulfillment of standards for the Initial Accreditation of Higher Education Institutions and Study Programmes, which indicates their significance.

Learning outcomes are mentioned in Articles 34, 38, 132 and 154 of the Law on Higher Education of the Republic of Serbia [4]:

- » Article 34, which refers to types of studies, paragraph 4 reads as follows: "For the purpose of professional training of persons who have acquired secondary education, aimed at inclusion in the work process, a short programme of studies, which has a clearly defined structure, purpose and learning outcomes, and for which a certificate of completion of the short programme of studies and acquired competence is issued, shall be performed."
- » Article 38, which refers to study programs content, states in item 3 that a study program, among other things, shall determine "outcomes of the learning process in line with the law governing the national framework of qualifications"
- » Article 132, which refers to the recognition of a higher education document for the purpose of continuation of education, paragraph 2 reads as follows: "Within the procedure referred to in paragraph 1 of this Article, the continuation of education and the enrolment of the higher educational degree, can be conditioned by the obligation of acquiring additional learning outcomes or rejected thereof, if determined that there is an essential difference between the type and level of the acquired knowledge and skills and the conditions for the enrolment in a specific study programme."
- » Article 154 specifies that "until the adoption of the law on the national framework of qualifications (which was adopted in the meantime), the higher education institutions shall determine the outcomes of the learning process referred to in

Article 38, item 3) of this Law in line with the regulations which were adopted until the entry into force of this Law."

In the Law on the National Qualifications Framework of the Republic of Serbia [5], learning outcomes are mentioned in Articles 2, 3, 4, 6 and 22:

- » In Article 2, General Terms and Definitions, the terms qualifications (which mentions the concept learning outcomes) and learning outcomes are defined:
 - » "Qualification – formal recognition of acquired competences. An individual shall acquire a qualification when a competent body determines that he/she achieved the learning outcomes of a certain level, corresponding the designated qualification standard, as acknowledged by a public document (a diploma or a certificate)"
 - » "Learning outcomes – are distinct statements of what an individual is expected to know, understand and be able to demonstrate and/or perform after having completed a learning process. They allow for the verification of levels of acquired competences and/or obtained knowledge, skills, attitudes and abilities"
- » In Article 3, NQFS Objectives, the third objective refers to learning outcomes, stating that: "ensuring the focus of entire education on learning outcomes that underpin the competences defined by the standard related to a particular qualification"
- » In Article 4, NQFS Principles, the ninth principle is "Quality Assurance – managing the process of qualification development based on learning standards and outcomes, including the quality system with respect to the process of qualification acquisition and assessment"
- » Article 6, Descriptors of Qualification Levels, reads as follows: "Each level and sub-level of qualifications referred to in Article 5 hereof, have been assigned a descriptor required for performing a job or for further learning. The qualifications are classified per levels, based on the complexity of learning outcomes."
- » Article 22, Responsibilities of Sector Skills Councils, states that Sector Skills Councils shall "provide opinion on expected outcomes of knowledge and skills within the sector".

The term learning outcomes is mentioned in the documents referring to accreditation standards on two occasions, namely in:

- » Standards and Instructions for Accreditation of Study Programs of the First and Second Degree,
- » Standards and Instructions for Accreditation of Higher Education Institutions (faculties, colleges and vocational colleges).

Learning outcomes are mentioned in the following standards within the Standards and Instructions for Accreditation of Study Programs of the First and Second Degree [6]:

- » Standard 1. The structure of the study program,
- » Standard 4. Competencies of graduate students,
- » Standard 5. Curriculum,
- » Standard 15. Distance learning.

In the Standards and Instructions for Accreditation of Higher Education Institutions and Study Programs [7], learning outcomes are mentioned within the following standards:

- » Standard 4: Studies,
- » Standard 13: Access to Information of Public Importance.

In the Regulation on Standard for Self-evaluation and Quality Assessment of Higher Education Institutions and Study Programs [8], learning outcomes are mentioned in the following standards:

- » Standard 4: Quality of the study program,
- » Standard 5: Quality of the teaching process,
- » Standard 8: Quality of students.

U standardu 4 se pojam ishodi učenja pojavljuje veliki broj puta.

The term learning outcomes features repeatedly in Standard 4.

In the document Instructions for Review Commission for the Assessment of the Fulfillment of standards for the Initial Accreditation of Higher Education Institutions and Study Programmes [9], learning outcomes feature within the following standards:

- » Standard 1. The structure of the study program,
- » Standard 4. Competencies of graduate students,
- » Standard 5. Curriculum,
- » Standard 15. Distance learning.

Learning outcomes are also mentioned in other documents for reviewers, but we will not list them here.

Learning outcomes can be defined for scientific discipline at all levels: global level, regional level, state level, level of education, study program, course, teaching unit and lesson/class (Figure 1). However, in line with the requirements of the Standards and Instructions for Accreditation of Study Programs of the First and Second Degree, learning outcomes in Serbia must be defined at the level of a course/study subject. In addition, the self-evaluation report requires mapping courses/subjects by learning outcomes. It would be logical to perform mapping according to the learning outcomes of a study program, but when it comes to study programs, standards do not mention learning outcomes, but competencies instead.

By passing the Law on the National Qualifications Framework, which uses the term qualifications with regard to learning outcomes, Serbia has linked its national framework with the European qualifications Framework.

Accreditation documents do not mention learning outcomes at other levels, except the course/subject and study program level (study programs mention competencies), but it would make sense that a teacher teaching the given subject would define learning outcomes for each class/lesson, in line with the subject/course learning outcomes.

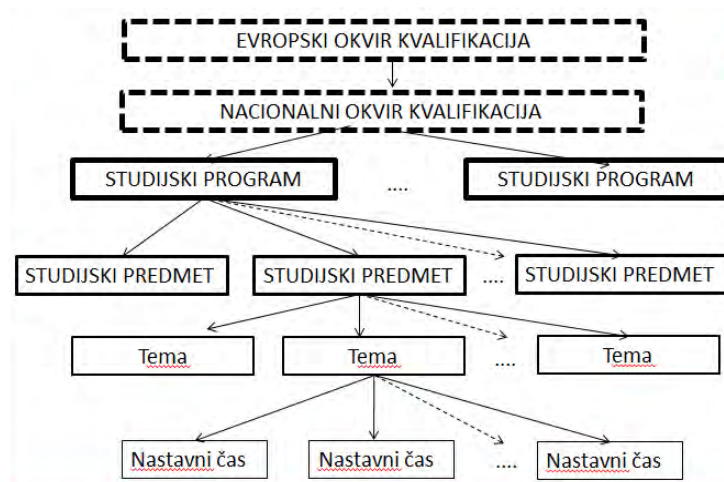


Figure 1. Structure of learning outcomes

3. Application of learning outcomes at ITS

The Information Technology School – ITS has paid great attention to learning outcomes ever since 2010 and its first accreditation in 2007. Learning outcomes have been written for all study programs and courses/subjects, which is one of the requirements in the preparation for accreditation. During the preparation of the self-evaluation report for 2012, all courses (both compulsory and elective) were mapped according to the categories of competencies (general, subject-specific), which were considered learning outcomes for study programs Information Technologies (IT) and Electronic Business (EB), and in 2014, for new study programs, Organization of Business Systems (OBS), and Computer Multimedia (CM), something ITS was obligated to do according to the self-evaluation instructions.

In order to fully realize this process, we believed that the writing (and implementation) of learning outcomes should continue, from the level of course topics to the level of individual lessons/classes. Needless to say, learning outcomes should be in correlation with topic outcomes, and course outcomes in correlation with the outcomes of a study program. Therefore, they had to be developed from the level of the study program and course to the level of the lesson.

This is why, learning outcomes have been written (7-10 outcomes per lesson) for each teaching unit (which corresponds to a 45-minute school period), first for Information and Internet Technologies, followed by Computer Networks and Information Systems Reliability courses, and communicated to students at the beginning of each lesson since 2013/2014.

Due to the significance of the application of learning outcomes in the teaching process, and in order to extend this approach to other study programs, workshops for teachers were organized, where they could learn how to write learning outcomes, and perform assessment in line with them. The importance of learning outcomes was mentioned in a blog post (Student, instead of teacher, in the focus of educational process) from December 2013 [10], and another from March 2016, titled Learning outcomes = What material will be covered in the exam? [11].

The need for the application of learning outcomes have been recognized by others as well, so at their request, a lecture was held at the Conference of Academies for Applied Studies in 2016, and the presentation is available on the website [12]).

4. Application of learning outcomes in the classroom at ITS

As already mentioned, learning outcomes were written for each class/lesson of Information and Internet Technologies, Computer Networks and Information Systems Reliability courses, and implemented throughout the semester. After that, a survey about the Information and Internet Technologies was conducted among students of two consecutive years of study, i.e. two generations.

Students were encouraged to use the written learning outcomes for the Information and Internet Technologies course, by outlining the learning outcomes for each lesson in the presentation, and providing a certain number of questions to check these outcomes at the end of the presentation. The outcomes for each lesson comprise 7-10 outcomes, but there are usually 5 questions at the end of each lesson, so not all outcomes are covered by these questions.

Thus, starting from the learning outcomes given at the beginning of the lesson (teaching unit), a student can identify which learning outcomes are covered by the questions for reviewing the lesson, and which are not.

When testing knowledge, i.e. fulfillment of the learning outcomes in a test, colloquium and/or exam, 70% of the questions given after each teaching unit feature in the test, as well as 30% new questions which still refer to the content of the given teaching units. Students can guess the teaching units from which these 30% of questions will be derived based on the learning outcomes, which motivates them to learn, because they know what content will be tested and what they are expected to know, and it is well-known that students primarily learn content that is expected to feature in the exams.

Experience shows students will, as a rule, learn those things they believe or expect to be featured in an exam, instead of the content defined in the curriculum, or even content covered in class [13, 14]. Therefore, why not given them clear information about what they are expected to learn, because after all, this is defined in the learning outcomes of the course/subject (as a requirement of the accreditation standards). The only thing that remains is the implementation in everyday teaching, i.e. defining learning outcomes for each class/lesson.

In other words, a student who is familiar with the learning outcomes has a clear idea of what awaits them during knowledge assessment (colloquia, final exams, etc.).

Of course, this requires additional effort on the teachers' part. They should be well-acquainted with the learning outcomes of their subject defined during the accreditation, and consistently develop them for each topic, and each lesson/teaching unit. There are numerous recommendations and tips on how to write learning outcomes, for example in [13, 14]. We will mention some for illustrative purposes: begin each learning outcome with an active verb; use a single verb for each learning outcome; avoid non-operational concepts such as to know, to understand, to learn, to be familiar with, to be aware of, because they refer to

learning goals rather than learning outcomes; learning outcomes must be clear and measurable; they must be such that they can be assessed (it must be possible to measure their fulfillment); whether they can be achieved in the given period, etc.

On the other hand, well-defined learning outcomes [13, 14] help teachers to tell students more precisely what is expected of them; to choose appropriate teaching methods consistent with the learning outcomes; to establish appropriate methods of knowledge assessment consistent with the learning outcomes; to prepare the teaching material more efficiently, because the learning outcomes serve as a guide, etc. If there are defined learning outcomes for each lesson/teaching unit and questions for reviewing that lesson, it is easier to determine whether these questions really test the adoption of the teaching content covered in the lesson, and defined in the learning outcomes.

Teachers were not interviewed, although we believe that it would be useful to learn their views on this matter as well. A brief insight into the teaching material of randomly selected teachers shows that almost a half of the teachers did not adopt the approach where they communicate learning outcomes for each teaching unit/lesson to students, and even those who use different approaches, or incorrectly defined learning outcomes. Therefore, there are reasons to continue with the workshops which train teachers and motivate them to implement teaching material through pre-defined learning outcomes for each lesson/teaching unit.

To check if students understand and accept the approach where the learning outcomes for each teaching unit are defined and communicated in advance, we conducted an anonymous survey among two generations of students.

5. Results of the survey on the application of learning outcomes at ITS

The survey was conducted in 2016 and 2017 for the Information and Internet Technologies course, among two generations of Year 1 students, after the 2nd colloquium [15–18].

In 2016, the sample comprised 132 students, and in 2017, 150 of them. Both times, the questionnaire included the same 4 questions, the first of which was whether the student took and passed the 1st colloquium. The percentage of students who passed both colloquia in this course is rather high (between 80% and 90%).

The results of the other 3 questions regarding learning outcomes are summed up in Table 1, by providing comparative data, first for the 2016/2017 survey.

The numerical results in Table 1 show that about 90% of students from both generations believe that learning outcomes have indeed helped them, completely or to a certain extent, although there are differences between the two groups.

The percentage of students who stated that they did not use learning outcomes at all was under 10%.

The situation is similar when it comes to the identification of those 30% of questions that do not appear at the end of the teaching units, but are featured in the colloquia and exams.

When asked “Do you believe that it is useful to have written learning outcomes for the course/subject, based on which you know what you are expected to learn, and what will be covered in the exam?”, about 4% more students answered positively in 2017 – 84,67% (compared to the previous year 78,79%), whereas only 0,7% (as opposed to 3% in the previous year) answered negatively, and 14,67% (as opposed to 18,18% in the previous year) was undecided.

Overall, the results of the survey on a significant sample (about one third of the total number of Year 1 students in all study programs, i.e. three quarters of students in the Information Technologies program) show that students use learning outcomes (provided that they have them in writing for each teaching unit, i.e. lesson), that they find them helpful with regard to what they should learn, what to expect in exams/tests, and what material will be covered in exams/tests. In addition, more students stated that they find defining learning outcomes for the course useful, because they know what to expect, what to learn, and what will be covered in exams in 2017 than in the previous year, which shows that they understand the importance and usefulness of learning outcomes.

No.	Question	Answer No.	Answer %	% Answer %
1	I used learning outcomes written for the course/subject:			
	a) all the time	55/41	41,98/27,52	90,83/88,59
	b) occasionally	64/91	48,85/61,07	
	c) never	12/11	9,16/7,38	
	131/149			
2	Learning outcomes helped me identify 30% of the questions featured in exams and colloquia, but not at the end of the teaching units:			
	a) to a great extent	62/58	48,06/36,25	93,8/88,25
	b) to a certain extent	59/78	45,74/52	
	c) not at all	8/14	6,2/9,33	
	129/150			
3	Do you find it useful to have written learning outcomes for a course, based on which you know what you are expected to learn, and what will be featured in the exam?			
	a) Yes	104/127	78,79/84,67	
	b) NO	4/1	3,03/0,7	
	c) I'm undecided.	24/22	18,18/14,67	
	132/150			

Table 1. Students' answers to the questions regarding learning outcomes (data given in the form 2016/2017) [18]

6. Conclusion

Learning outcomes have been introduced into laws (Law on Higher Education, and National Qualifications Framework), and standards for accreditation and self-evaluation of higher education institutions and their study programs, and accepted as a method of increasing the quality of higher education. The laws and standards for accreditation and self-evaluation obligate higher education institutions to apply them. As teachers have a key role in higher education institutions, it is crucial that they are familiar with the essence of learning outcomes, and apply them in the teaching process, not only at study program level, but also at the level of the lesson/teaching unit, i.e. that they are fully implemented at all levels of the teaching process. This is why the Information Technology School has undertaken several activities (mapping courses according to the outcomes of study programs, writing learning outcomes for each lesson/teaching unit, organizing workshops for teachers and associates dedicated to writing learning outcomes and performing assessment in line with the learning outcomes).

The surveys conducted among students about the use of learning outcomes for each teaching unit/lesson show that students use the previously communicated learning outcomes, that they help them understand what is expected of them, and what knowledge will be tested in exams, i.e. what they should learn. In addition, students find written learning outcomes for each subject/course useful, because they help them identify what they are expected to learn.

This survey only included students, but it would be useful to interview teachers as well, and learn their attitudes, experiences and problems regarding learning outcomes. An insight into the teaching material of randomly selected teachers shows that some teachers still haven't adopted the approach to communicate learning outcomes for each teaching unit/lesson to their students.

References

- Pokorni S., Kuleto V. Kvalitet obrazovanja u Visokoj školi strukovnih studija za informacione tehnologije. 15. međunarodna konferencija „Upravljanje kvalitetom i pouzdanost ICDQM-2012“, Zbornik radova, pp 24–33, Beograd, 28–29. jun 2012. (plenarno saopštenje)
- Pokorni S. Student, ne nastavnik, u centru nastavnog procesa. [Internet] Available from: <https://www.its.edu.rs/2013/12/17/student-ne-nastavnik-u-centru-obrazovnog-procesa/>
- Pokorni S. Ishodi učenja = šta će biti na ispitu. [Internet] Available from: <https://www.its.edu.rs/2016/03/25/ishodi-ucenja-sta-ce-biti-na-ispitu/>
- Pokorni S. Ishodi učenja. [Internet] Available from: <https://slidetodoc.com/ishodi-ucenja-prof-dr-slavko-pokorni-slavko-pokorniits/>
- Kennedy D. Pisanje i upotreba ishoda učenja, praktični vodič, 2. izdanje, Tempus kancelarija u Srbiji, Pintor Project; 2007.
- Pokorni S. Analiza ankete studenata o ishodima učenja predmeta Informacione i internet tehnologije, Visoka škola strukovnih studija za informacione tehnologije, Beograd; 2016.
- Pokorni S. Analiza ankete studenata o ishodima učenja predmeta Informacione i internet tehnologije, Visoka škola strukovnih studija za informacione tehnologije, Beograd; 2017.
- Pokorni S., Kuleto V. Ishodi učenja u Visokoj školi strukovnih studija za informacione tehnologije, 19. međunarodna konferencija Upravljanje kvalitetom i pouzdanost ICDQM-2016, Zbornik radova, 29–30. jun 2016. pp 118–122.
- Pokorni S., Kuleto V., Ristić B. Primena ishoda učenja u nastavnom procesu, Informacione tehnologije, obrazovanje i preduzetništvo, ITOP18, Zbornik radova, Čačak (od 24. do 25. 3. 2018), str. 29–34, COBISS.SR-ID259599372, uvodni referat
- European Commission. European credit transfer and accumulation system (ECTS): Key features. Luxembourg: Office for Official Publications of the European Communities; 2004. ISBN 92-894-4742-7 [Internet] Available from: https://www.udg.edu/ca/portals/5/come/ECTS_en.pdf
- Cedefop. Defining, writing and applying learning outcomes. A European handbook. Luxembourg: Publications Office of the European Union; 2017. <https://>

- op.europa.eu/en/publication-detail/-/publication/5f2ecb9c-dfbb-11e7-9749-01aa75ed71a1/language-en
12. Zakon o visokom obrazovanju Republike Srbije. Službeni glasnik Republike Srbije, br. 88/2017, 73/2018, 27/2018 – dr. zakon, 67/2019, 6/2020 – dr. zakoni, 11/2021 – autentično tumačenje, 67/2021 i 67/2021 – dr. zakon. [Internet] Available from: https://www.paragraf.rs/propisi/zakon_o_visokom_obrazovanju.html
 13. Zakon o nacionalnom okviru kvalifikacija, Službeni glasnik Republike Srbije, br. 27/2018 i 6/2020. [Internet] Available from: <https://www.paragraf.rs/propisi/zakon-o-nacionalnom-okviru-kvalifikacija-republike-srbije.html>
 14. Kennedy D. Writing and Using Learning Outcomes, A Practical Guide. Quality Promotion Unit, UCC. 2007 [Internet] Available from: <https://www.cmepius.si/wp-content/uploads/2015/06/A-Learning-Outcomes-Book-D-Kennedy.pdf>
 15. Pravilnik o standardima i postupku za akreditaciju studijskih programa. Standardi i uputstva za akreditaciju studijskih programa prvog i drugog stepena. Nacionalni savet za visoko obrazovanje. 25. 2. 2019. [Internet] Available from: <https://www.nat.rs/pravilnici/>
 16. Pravilnik o standardima i postupku za akreditaciju visokoškolskih ustanova. Standardi i uputstva za akreditaciju visokoškolskih ustanova (fakultet, visoka škola i visoka škola strukovnih studija). Nacionalni savet za visoko obrazovanje. 28. 1. 2019. [Internet] Available from: <https://www.nat.rs/pravilnici/>
 17. Pravilnik o standardima i postupku za samovrednovanje i ocenjivanje kvaliteta visokoškolskih ustanova i studijskih programa. Standardi i uputstva za samovrednovanje i ocenjivanje kvaliteta visokoškolskih ustanova i studijskih programa. Nacionalni savet za visoko obrazovanje. 25. 2. 2019. [Internet] Available from: <https://www.nat.rs/pravilnici/>
 18. Uputstva recenzentskoj komisiji za procenu ispunjenosti standarda za akreditaciju studijskih programa prvog i drugog stepena visokog obrazovanja. [Internet] Available from: <https://www.nat.rs/uputstvo-za-rad-recenzenata/>



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Razgovor o pametnoj urbanoj ekonomiji zasnovanoj na „big data“, na 6. Icesba međunarodnoj konferenciji o naučnoj i poslovnoj administraciji

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Apstrakt: U ovom radu bismo želeli da ukratko predstavimo međunarodni akademski skup – konferenciju ICESBA 2021, pod nazivom Pametna urbana ekonomija zasnovana na „Big Data“. Ova, šesta po redu ICESBA konferencija održana je u Bukureštu, od 26. do 27. novembra 2021. Zbog situacije sa pandemijom COVID-19, organizovan je prenos uživo onlajn, uz podršku platforme Google Meet, i obezbeđen je strim na YouTubeu.

Ključne reči: big data, pametno upravljanje, veštačka inteligencija, sistemi akustičnih informacija, sistem interneta stvari

1. Uvod

Međunarodna konferencija ICESBA 2021 – Pametna urbana ekonomija zasnovana na „Big Data“, čiji je organizator bukureštanski Fakultet ekonomskih nauka Univerziteta Spiru Haret, održana je online 26–27. novembra 2021. uz učešće brojnih profesora i istraživača iz zemlje i inostranstva. Poslednjih godina, Međunarodna konferencija ICESBA se stalno razvijala, a ovogodišnje izdanje bilo je najuspešnije do sada, sa velikim brojem učesnika i govornika.

Konferenciju ICESBA 2021, 6. Međunarodnu konferenciju o ekonomskoj nauci i poslovnoj administraciji, pod naslovom PAMETNA URBANA EKONOMIJA ZASNOVANA NA „BIG DATA“, organizovao je Univerzitet Spiru Haret iz Bukurešta, u Rumuniji, uz posredstvo Centralnog instituta za istraživanje i na inicijativu Fakulteta ekonomskih nauka iz Bukurešta. Domaćini ove međunarodne konferencije su bili dvoje istaknutih profesora Univerziteta Spiru Haret: vanredni profesor dr Đeorde Lazaroju (George Lăzăroiu) Fakulteta ekonomskih nauka u Bukureštu, Rumunija i član Američke asocijacije za ekonomska istraživanja u Njujorku, SAD, i vanredna profesorka dr Elena Gurgu (Elena Gurgu), sa Fakulteta ekonomskih nauka, Bukurešt, Rumunija, zamenik glavnog urednika međunarodnog indeksiranog časopisa Anali Univerziteta Spiru Haret. Ekonomska serija.

Na otvaranju Međunarodne konferencije ICESBA 2021, u ime uprave Fakulteta ekonomskih nauka u Bukureštu, profesorka dr Luminica Jonesku (Luminița Ionescu) pozelela je dobrodošlicu gostima iz inostranstva i zahvalila se nastavnicima uključenim u organizaciju događaja. Zatim je vanredni profesor Đeorde Lazaroju, koji je sa oduševljenjem pozdravio sve učesnike i čestitao suorganizatorima konferencije, univerzitetima iz Sjedinjenih Država i Evrope, nakon čega je objasnio način rada konferencije. Vanredni profesor Elena Gurgu takođe se obratila rečima dobrodošlice učesnicima iz Rumunije i inostranstva i predstavila neke od gostiju sa prestižnih univerziteta Evrope, Afrike i Azije.

2. Kratko predstavljanje organizatora

A sada, dozvolite nam da vam kažemo nekoliko reči o organizatorima.

Univerzitet Spiru Haret je privatni univerzitet u Bukureštu, u Rumuniji, koji je 1991. osnovao predsednik Fondacije Rumunija sutrašnjice (Tomorrow's Romania Foundation) Aurelijan Đ. Bondrea (Aurelian Gh. Bondrea), u okviru nastavnih aktivnosti ove fondacije. Univerzitet je organizovan po modelu primenjenom na Univerzitetu Harvard u SAD. Univerzitet nosi ime naučnika i reformatora obrazovanja u Rumuniji, Spiru Hareta, koji je živeo pre Prvog svetskog rata. Nacionalni savet za akademsku evaluaciju i akreditaciju visokoškolskih institucija je dao akreditaciju Univerzitetu 14. 2. 2000. godine; 2009, Univerzitet je imao 30 fakulteta sa 49 specijalizacija i 64 master programa i po mišljenju lista Financiarul predstavljao najveći univerzitet u Rumuniji. Prema izveštaju za 2009, upisano je 311.928 studenata. Na osnovu broja studenata predstavlja drugi po veličini univerzitet u svetu, posle Islamskog Azad Univerziteta (sa 1,3 miliona studenata). Papa Jovan Pavle II i bivši rumunski predsednik Ion Iliesku primili su počasne doktorate ovog univerziteta. Nacionalni akademski informativni centar za evaluaciju Ujedinjenog Kraljevstva uvrstio je Univerzitet Spiru Haret na listu priznatih visokoškolskih institucija 2016. godine.

Centralni istraživački institut Univerziteta Spiru Haret predstavlja istraživačku jedinicu na nivou Univerziteta i obezbeđuje naučnu i metodološku koordinaciju istraživačkih centara Univerziteta. Centralni istraživački institut teži da:

- » konsoliduje multidisciplinarna akademska istraživanja (interdisciplinarna i ona unutar jedne discipline);
- » obezbedi uslove u skladu sa zahtevima Univerziteta radi učestvovanja u nacionalnim i međunarodnim istraživačkim mrežama i programima;
- » obezbedi posebne usluge različitim korisnicima;
- » doprinese omogućavanju citiranja publikacija Univerziteta njihovim uključivanjem u međunarodne baze podataka;
- » obezbeđuje stalne izvore finansiranja;
- » unapređuje naučne rezultate nastavnog i istraživačkog kadra Univerziteta na nacionalnom i međunarodnom nivou;

- » edukuje studente osnovnih, master i doktorskih studija da budu konkurentni u svom profesionalnom i naučnom radu;
- » bude uključen u istraživanje realnih problema u svetu kroz oblike javnog ili privatnog partnerstva.

2.1. Suorganizatori internacionalnog skupa ICESBA 2021

U organizaciji ove konferencije, kroz partnerski odnos, učestvovala su ugledne obrazovne institucije i naučni instituti iz celog sveta: Američka asocijacija za ekonomska istraživanja iz Njujorka, SAD; Univerzitet za turizam i menadžment Republike Azerbejdžan iz Bakua; Institut TESEO iz Salerna, Italija; Nacionalni institut za ekonomska istraživanja iz Kišinjeva, Republika Moldavija; Nacionalni vojni univerzitet Vasil Levski iz Velikog Trnova, Republika Bugarska; Univerzitet Šlezije u Opavi, Češka Republika; Univerzitet Privredna akademija u Novom Sadu, Republika Srbija; Fakultet savremenih umetnosti iz Beograda, Republika Srbija; Visoka škola strukovnih studija za informacione tehnologije ITS – Beograd, Republika Srbija; Univerzitet Johanezburga, Južnoafrička Republika; Univerzitet Zilina (UNIZA), Slovačka Republika; USH ProBusiness iz Bukurešta, Rumunija; Vishwa Viswani Institut za sisteme i menadžment iz Hajderabada, Indija i Vishwa Viswani poslovna škola iz Hajderabada, Indija.

Ali među najuticajnijim partnerima su svakako institucije koje dolaze iz Beograda, Republika Srbija, kojima su se organizatori zahvalili na poverenju, kao i na podršci aktuelnog međunarodnog skupa, na najbolji mogući način. Posebno priznanje odati je profesorki Mileni Ilić, zbog njene snažne podrške istraživanjima bitnim za institucije u kojima je angažovana na poziciji nastavnika.

A sada nam dopustite da kažemo još nekoliko reči o organizatorima.

Američka asocijacija za ekonomska istraživanja iz Njujorka, SAD, sprovodi istraživanja o automatizaciji zasnovanoj na kognitivnoj tehnologiji; njen predsednik je Majkl A. Piter (Michael A. Peters), profesor emeritus na Univerzitetu Illinois. Najbolje rangirani fakulteti sa kojih dolaze autori su: Univerzitet Harvard, Univerzitet u Oksfordu, Univerzitet Jejl, Univerzitet Princeton, Institut za tehnologiju Masačusetsa, Univerzitet u Kembridžu, Univerzitet Stanford, Univerzitet Boston.

Univerzitet za turizam i menadžment Azerbejdžana (ATMU) u Bakuu obučava ljude u oblasti turizma. Ova institucija osnovana je pod pokroviteljstvom Ministarstva kulture i turizma Republike Azerbejdžan. Ciljevi univerziteta uključuju unapređivanje turističke industrije, te obučavanje kadrova radi zadovoljenja potrebe za kvalifikovanim osobljem u oblasti turizma, zabave i ugostiteljstva. Institut je prerastao u Univerzitet za turizam i menadžment Azerbejdžana. Ovaj univerzitet sarađuje sa mnogim lokalnim i međunarodnim organizacijama. U okviru te saradnje, sproveden je niz istraživačkih i razvojnih projekata i organizovana je i sprovedena razmena nastavnog osoblja i studenata.

Institut Teseo – Fondacija za visoko obrazovanje i istraživanje iz Salerna, u Italiji, nastao je februara 2019, najpre kao asocijacija za nauku, sa sedištem u San Donato Val di Kominu (okrug Forzinone, Lacio) u Italiji, a kasnije, jula 2020, postao je fondacija sa sedištem u San Čipriano Pićentinu (okrug Salerno, Kampanija), u kome se trenutno nalaze operativno i pravno odeljenje. Fondacija deluje u oblasti visokog obrazovanja i istraživanja, posebno u oblasti studija jezičke medijacije i obuka, studija jezika, ekonomskih studija i psiholoških nauka primenjenih na polje neurolingvistike.

Nacionalni institut za ekonomska istraživanja iz Kišinjeva, Republika Moldavija, javna je institucija (think-tank) koja se bavi naučnim istraživanjem u oblasti ekonomije. Njeni najznačajniji korisnici su Ministarstvo ekonomije, Ministarstvo poljoprivrede i prehrambene industrije, Ministarstvo rada i socijalne zaštite, Naučna akademija i dr. Najvažnije aktivnosti Instituta tiču se naučnih istraživanja u ekonomiji, finansijama, demografskoj oblasti, reformama u socijalnoj sferi i integraciji Republike Moldavije u svetske ekonomske krugove. Ranija iskustva pokrivaju široku lepezu istraživanja primenjenih u evoluciji ekonomskih i socijalnih procesa u Republici Moldaviji, obezbeđujući stabilan ekonomski rast i visok životni standard. Najvažniji pravci istraživanja su: ekonomski i finansijski modeli; mehanizmi za održivi razvoj; okruženje za poslovno delovanje i investicije; poljoprivredna politika i baze podataka za ruralni razvoj u kontekstu bezbednosti hrane; unapređivanje statističkog informacionog sistema u skladu sa standardima EU; demografska i društvena razvojna politika.

Nacionalni vojni univerzitet Vasil Levski iz Velikog Trnova, Republika Bugarska sprovodi obuke za kadete i studente u trima oblastima visokog obrazovanja: društvene, ekonomske i pravne nauke; tehničke nauke; bezbednost i odbrana, organizovane u sedam profesionalnih oblasti, petnaest civilnih i jednu vojnu specijalnost i dvadeset jednu vojnu specijalizaciju za potrebe različitih rodova vojske i specijalnih snaga. Takođe, Univerzitet organizuje studijske programe za doktorande u petnaest akreditovanih naučnih specijalizacija/oblasti, kao i kontingente bugarske armije za učestvovanje u misijama u inostranstvu.

Univerzitet Šlezije u Opavi, Češka Republika, ima visok stepen uspešnosti kada je reč o istraživanjima na osnovu QS svetske rang-liste univerziteta, i ima tri fakulteta: filozofija i nauka, javna politika, i matematika. Svi ovi fakulteti nude programe na nivou osnovnih, master i doktorskih studija.

Univerzitet Privredna akademija u Novom Sadu (UBANS) u Republici Srbiji je naučna institucija visokog obrazovanja, autonomni, privatni univerzitet, u skladu sa Zakonom o visokom obrazovanju Srbije. UBANS, osnovan 2000. godine, jeste prvi privatni univerzitet u Autonomnoj Pokrajini Vojvodini akreditovan od nacionalnih i međunarodnih organa za osiguranje kvaliteta. Univerzitet je dobio akreditaciju Komisije za akreditaciju i obezbeđivanje kvaliteta Ministarstva obrazovanja, nauke i tehnološkog razvoja, koje je član Međunarodne mreže agencija za obezbeđivanje kvaliteta u visokom obrazovanju (INQAAHE) i kandidat za članstvo u Evropskoj asocijaciji za obezbeđivanje kvaliteta u visokom obrazovanju (ENQA).

Fakultet savremenih umetnosti iz Beograda, koji je u sklopu Univerziteta Privredna akademija u Novom Sadu, u Srbiji, akreditovan je kao fakultet izvođačkih i primenjenih umetnosti koji nudi široku lepezu neophodnih veština za svakog umetnika u 21. veku. Osnovan je 1997. kao prvi privatni umetnički fakultet u Srbiji. Oblikovao je mnoge uspešne i priznate umetnike, poznate ne samo u regionu već i u najznačajnijim umetničkim centrima u svetu. Studijski program je kreiran u skladu sa savremenim trendovima umetničke prakse koja ne postavlja granice između umetničkih medija, načina izražavanja i senzibiliteta umetnika. Studijski programi postoje na nivou osnovnih, master i doktorskih studija.

Visoka škola strukovnih studija za informacione tehnologije ITS – Beograd iz Republike Srbije je prva privatna akreditovana visokoškolska ustanova u oblasti informacionih tehnologija u Republici Srbiji. Nudi izuzetne uslove studiranja, vrhunsku opremu, stručan kadar, praktičnu primenu stečenih znanja, najtraženije profesionalne profile današnjice, međunarodno priznate sertifikate i rad u odabranom polju još tokom studija. Studijski program postoji na nivou osnovnih i master strukovnih studija.

Univerzitet Johanezburga (UJ) je državni univerzitet koji se nalazi u Jonahezbргу, u Južnoafričkoj Republici. Univerzitet je nastao 1. 1. 2005. kao rezultat spajanja Univerziteta Rand Afrikaans (RAU), Technikon Witwatersrand (TWR) i dva kampusa

Vista Univerziteta, Soweto i East Rand. Novonastala institucija jedna je od najvećih u visokoobrazovnom sistemu Južnoafričke Republike, koji obuhvata 26 državnih univerziteta. Uj pohađa 50.000 studenata, od kojih su više od 3.000 međunarodni studenti koji dolaze iz 80 zemalja. Uj je jedan od najbolje plasiranih univerziteta Južnoafričke Republike, a visoko je pozicioniran i na QS rang listi univerziteta u svetu, kao i na drugim globalnim listama.

Univerzitet Zilina iz Slovačke Republike ima veoma visok broj istraživačkih radova na osnovu QS rang liste univerziteta u svetu. Tokom poslednjih 57 godina, više od 52.000 studenata steklo je diplomu na ovom univerzitetu. Među njima, 1.662 je dobilo doktorsku titulu.

USH Pro Business iz Bukurešta, u Rumuniji, specijalizovani je Centar za aktivnosti usmerene ka preduzetničkom okruženju Univerziteta Spiru Haret, s obzirom na to da je kreiran da podrži kompanije i ponudi rešenja koja podstiču konkurenciju. Centar pruža specijalizovane usluge i pomoć preduzetnicima kroz projekte i programe zasnovane na ranijoj konsultaciji sa kompanijama i asocijacijama iz poslovnog okruženja. USH Pro Business Center poboljšava kvalitet postojećih usluga na današnjem tržištu tako što razume potrebe partnera i povezuje ih sa istraživačkim i obrazovnim institucijama. Nudeći visokokvalitetne usluge rumunskom poslovnim okruženju, uz dinamičan i inovativan pristup, USH Pro Business pruža kompletne usluge koje obuhvataju raznovrsne aktivnosti, istraživanja i inovacije usmerene ka tržišnim rešenjima, profesionalnu i strukovnu obuku, sve do usluge podrške, kako bi se podstakla konkurencija kompanija i klastera, organizacija poslovnih skupova itd. USH Pro Business obezbeđuje pažljivu i detaljnu opservaciju promena i trendova u poslovnim okruženju kako bi njihovi partneri imali koristi zahvaljujući pažljivo dokumentovanoj profesionalnoj asistenciji.

Vishwa Vishwani institucije sistema i menadžmenta, koje uključuju Vishwa Vishwani poslovnu školu iz Hajderabada u Indiji, treća su najveća grupa poslovnih fakulteta u južnoj Indiji, sa više od dve decenije značajnog doprinosa obrazovanju i istraživanju u oblasti menadžmenta. Ova grupa ima tri institucije koje nude programe na nivou osnovnih i postdiplomskih studija u oblasti poslovnog menadžmenta i informacionih tehnologija.

Konferencija ICESBA 2021 je imala tri medijska partnera: izdavačku kuću Fondacija Rumunija sutrašnjice iz Bukurešta, USH Akademske nedeljne novine – Akademske novine nacionalnog mnjenja iz Bukurešta, i USH radio-stanicu Radio 7, takođe iz Bukurešta, u Rumuniji.

Partner konferencije ICESBA 2021 u oblasti izdavaštva bio je međunarodni indeksirani časopis Anali Univerziteta Spiru Haret. Ekonomska serija – ASHUES. Anali Univerziteta Spiru Haret. Ekonomska serija – ASHUES predstavlja međunarodno recenziran časopis, čiji je glavni urednik rektor Univerziteta Spiru Haret iz Bukurešta, Rumunija, profesor dr Aurelijan A. Bondrea (Aurelian A. Bondrea) (<http://anale-economie.spiruharet.ro/editor.html>). Časopis objavljuje visokokvalitetne akademske članke iz oblasti ekonomije od 2000. godine. Recenzija je efikasna, veoma rigorozna i autori su vođeni kroz ceo tok procesa objavljivanja. Anali Univerziteta Spiru Haret. Ekonomska serija – ASHUES su indeksirani u međunarodnim bazama podataka i bibliotekama: RePEc, ERIHPLUS, SSRN, ROAD, BASE, INDEX COPERNICUS INTERNATIONAL, DOAJ, ECONBIZ, INFOBASE INDEX, CROSS REF DOI, OAJI, WORLDCAT, OPEN AIRE, RESEARCH BIB, CEEOL, J-GATE, JOURNAL TOCs, PKP, OPEN ARCHIVES, GOOGLE SCHOLAR, ILLINOIS LIBRARY, ELECTRONIC JOURNALS LIBRARY, EUROPUB, STANFORD UNIVERSITY LIBRARIES, CORNELL UNIVERSITY LIBRARY AND OPENLIBRARY (<http://anale-economie.spiruharet.ro/indexing.html>).

2.2. Kratka beleška o dvodnevnom toku konferencije

Međunarodna konferencija ICESBA 2021 održana je online putem Google Meeta uz prezentacije preko video-strima, 26. i 27. novembra 2021. Predstavljen je veliki broj naučnih radova (56 radova) iz oblasti tehničko-tehnoloških i društveno-humanističkih nauka, čiji su autori profesori, naučni istraživači i mladi naučnici iz celog sveta (14 zemalja), koji su predstavili svoje radove putem četiri konferencijska panela, održana na daljinu zahvaljujući IKT-u, zbog poštovanja epidemioloških mera i preporuka:

- » „Pametno upravljanje i urbana ekonomija bazirana na znanju“ (Panel 1);
- » „Pametni marketing baziran na Big Data“ (Panel 2);
- » „Algoritamski informacioni sistemi za računovodstvo na bazi analize podataka“ (Panel 3);
- » „Veštačka inteligencija iza sistema interneta stvari na osnovu analize podataka“ (Panel 4).

U okviru plenarnih sesija na kojima su predstavljeni radovi uvodničara učestvovalo je 25 istaknutih akademaca i naučnih istraživača. U toku drugog dana konferencije, radovi su prezentovani u sklopu sva četiri panela; učestvovalo je ukupno 80 autora.

Plenarna sesija konferencije, rezervisana za uvodničare, trajala je tokom celog dana 26. 11. 2021. i predstavljala je pravi naučni maraton koji je počeo u 9 sati ujutru po istočnoevropskom vremenu, uz kratku proveru funkcionisanja online platforme, i završio se govorom domaćina na ceremoniji zatvaranja u 7 uveče. U toku plenarne sesije, 25 gostiju iz 14 zemalja, jedno za drugim, imali su izlaganja u trajanju od oko 10 minuta, uz 5 minuta vremena za pitanja i odgovore. Debata o naučnim radovima je bila dinamična i konstruktivna, u opuštenoj atmosferi. Snimak cele plenarne sesije, kao i registracije na panel, dostupni su putem linka <http://icesba.eu/virtual.html>, na veb-sajtu konferencije, icesba.eu. [1]

Sada nam dopustite da vam predstavimo uvodničare međunarodne konferencije ICESBA 2021.

Melina Alegro (Melina Allegro) je potpredsednica, direktorka za međunarodne, spoljne i orijentacione kontakte i član Odbora direktora Instituta Teseo za visoko obrazovanje i istraživanje iz Salerno, Italija. Diplomirala je obrazovne nauke i stekla zvanje Strukovni master 2. nivoa – Uprava, menadžment i razvoj ljudskih resursa u državnoj administraciji. Ona je takođe stalni predavač na MIUR – Italijanskog ministarstva za obrazovanje, univerzitet, istraživanje, Rim, Italija, kvalifikovana da predaje humanističke nauke u srednjoj školi; instruktorka je u oblasti eksperimentalne pedagogije i obuka, obrazovne tehnologije. Bila je članica komisije za takmičenja u osnovnim školama 2016.

Neli Amarfi-Rajlean (Nelli Amarfi-Railean) je doktorka ekonomije i vanredna profesorka na odseku za ekonomske studije Fakulteta realnih, ekonomskih i ekoloških nauka na državnom univerzitetu Aleku Ruso u Baltiju, Republika Moldavija.

Stefano Amodio (Stefano Amodio) je doktor filozofije, predsednik, direktor nastave i profesor psihologije na univerzitetu Teseo u San Cipriano Pičetinu u Italiji.

Adam Balcežak (Adam Balcerzak) predaje na univerzitetu Varmia i Mazuri u Olštinu, Poljska. Beleži više od 500 citata u WoS-u i Scopusu. Glavni je urednik časopisa Oeconomia Copernicana, Web of Science, IF 4.274, AIS 0.305. Quartile in Category Economics: Q1

Dragan Ilić je stekao doktorsko zvanje na Fakultetu za ekonomiju i inženjerski menadžment 2011. Njegova akademska karijera je počela na univezitetu Educons 2006. Od 2011. radi kao predavač na Fakultetu za ekonomiju i inženjerski menadžment.

Do juna 2013. bio je direktor marketinga na Univerzitetu Privredna akademija u Novom Sadu, a u periodu od 2013. do 2015. dr Ilić je bio prodekan za nauku i međunarodnu saradnju na Fakultetu za ekonomiju i inženjerski menadžment. Od 2015. je koordinator za međunarodnu saradnju na Univerzitetu Privredna akademija u Novom Sadu, Republika Srbija. Prof. Ilić je redovni konsultant i analitičar na srpskoj nacionalnoj televiziji – Radio-televiziji Srbije i Radio-televiziji Vojvodine kada je reč o poljoprivredi, preduzetništvu, nacionalnoj ekonomiji i međunarodnom poslovanju. Od školske 2013/2014. gostujući je profesor na nekoliko univerziteta, gde je održao nekoliko predavanja u oblasti marketinga, logistike, poljoprivredne industrije i preduzetništva u menadžmentu: Fakultet logistike (Celje, Republika Slovenija), Budimpešta Metropolitan univerzitet (Budimpešta, Mađarska), Univerzite Sečenji Istvan, Kautz Đula, Fakultet za ekonomiju (Đer, Mađarska), EPHEC UNIVERSITY COLLEGE (Brisel, Kraljevina Belgija), Sakarya University (Ankara, Republika Turska) i Stuttgart Media University (Stuttgart, Savezna Republika Nemačka). On je takođe član akademske mreže Businet, koja okuplja više od stotinu obrazovnih institucija iz celog sveta. Objavio je više od 40 naučnih radova i istraživanja i učestvovao na preko 50 međunarodnih konferencija i skupova.

Milena Ilić je doktorka ekonomskih nauka i docentkinja na Fakultetu savremenih umetnosti u Beogradu i na Visokoj školi strukovnih studija za informacione tehnologije ITS – Beograd, Srbija. Milena je autorka deset udžbenika i urednica tri naučne monografije od međunarodnog značaja. Osim toga, objavila je više od 120 originalnih naučnih radova u međunarodnim i domaćim naučnim časopisima, monografijama i zbornicima od međunarodnog i nacionalnog značaja. Naučna polja u okviru kojih istražuje obuhvataju tehnologiju u obrazovanju, upravljanje ljudskim resursima, ekonomiju, cirkularnu ekonomiju, preduzetništvo itd.

Viktoria Jordaki (Victoria Iordachi) ima doktorsko zvanje u oblasti ekonomije i radi kao koordinator-istraživač na odeljenju za finansijska i monetarna istraživanja Nacionalnog instituta za ekonomska istraživanja (NIER) Ministarstva obrazovanja i istraživanja Republike Moldavije u Kišinjevu. Oblasti njenog naučnog interesovanja su: cirkularna ekonomija, klasterska udruženja, nelegalni protok novca, međunarodni finansijski tokovi, finansijska tržišta. Članica je timova na nekoliko istraživačkih projekata, nacionalni ekspert za evaluaciju obrazovnih programa, te članica naučnih komiteta na međunarodnim naučnim konferencijama.

Baktibek Isakov (Baktybek Isakov) podučava na kirgisko-turskom MANAS univerzitetu u Biškeku, Kirgistan. Autor je nekoliko monografija i mnogih članaka u časopisima sa recenzijama. Učestvovao je različitim međunarodnim projektima i suosnivač je Online univerziteta u Biškeku, Kirgistan.

Tomas Kliestik je redovni profesor i načelnik odeljenja za ekonomiju Fakulteta za operacije, ekonomiju transporta i komunikacije Univerziteta u Zilini. Ima više od 1.500 citata u WoS-u i Scopusu. Koordinator je međunarodne konferencije koja je dobro pozicionirana u WoS-u.

Maria Kovacova podučava na Fakultetu za operacije, ekonomiju transporta i komunikacije, Univerziteta Zilina. Ima više od 700 citata u WoS-u i Scopusu. Radi kao pomoćni koordinator na međunarodnoj konferenciji koja se često citira u WoS-u.

Valentin Kuleto je osnivač i predsednik vodeće multinacionalne kompanije LINKgroup, koja više od 25 godina uspešno deluje u oblasti obrazovnog menadžmenta, profesionalne edukacije i sertifikacije u oblasti informacione tehnologije i savremenog poslovanja. Vanredni je profesor na Fakultetu savremenih umetnosti u Beogradu i Visokoj školi strukovnih studija za informacione tehnologije ITS – Beograd, Republika Srbija. Dr Kuleto je autor pet knjiga i mnogih naučnih i stručnih radova objavljenih u časopisima i zbornicima domaćih i međunarodnih konferencija, kao i naučnih monografija od međunarodnog značaja u oblasti modernog obrazovanja, obrazovne tehnologije i informacione tehnologije.

Kostin Lijanu (Costin Lianu) je doktor nauka i vanredni profesor na Fakultetu ekonomskih nauka u Bukureštu, prorektor na Univerzitetu Spiru Haret i generalni direktor USH ProBusiness centra u Bukureštu, Rumunija.

Daniel Mejer (Daniel Meyer) je profesor na Koledžu za biznis i ekonomiju i direktor Škole za državnu upravu, administraciju i javnu politiku na Univerzitetu Johanezburg, Južnoafrička Republika. Ekspert je za analizu regionalnog i lokalnog ekonomskog razvoja i strateški razvoj. Razvio je brojne inovativne alate za merenje, indekse i skale za analizu regionalnih ekonomija. Od 2015. autor je više od 100 naučnih recenziranih radova i prezentovao je više od 60 radova na međunarodnim konferencijama, uključujući i brojna obraćanja kao uvodničar. Njegova istraživanja su multidisciplinarna kroz kombinovanje razvoja ekonomije, poslovanja, javne uprave i administracije. Uspostavio je veliku međunarodnu mrežu partnera u istraživanju širom sveta sa fokusom na Višegradsku grupu zemalja. Osim toga, on je uspešno formulisao i predstavio više od 40 regionalnih razvojnih strategija za lokalne i oblasne uprave. Takođe je uključen u brojne razvojne projekte zajednica u kojim živi. Tokom svoje akademske karijere primio je brojne nagrade, među kojima su: nagrada za najinspirativnijeg predavača 2012; prorektorova nagrada za angažman u zajednici putem inicijative Vaal boraca za lokalni ekonomski razvoj 2016; medijska ličnost godine 2016; najproduktivniji viši istraživač NWU (North-West University), Vaal kampusa 2016, 2017. i 2018; najproduktivniji viši istraživač NWU Fakulteta za ekonomiju i menadžment 2019; i drugoplasirani u rangiranju za najproduktivnijeg višeg istraživača 2020. na NWU. Njegov životni moto je „pruži više nego što uzimaš“.

Natanja Mejer (Natanya Meyer) je vanredna profesorka na odseku za poslovni menadžment Koledža za biznis i ekonomiju Univerziteta Johanezburg, Gauteng, Južnoafrička Republika. Deo je prosvetne katedre za preduzetništvo u okviru Južnoafričke istraživačke inicijative (SARChI) DHET-NRF. Njeno istraživanje se fokusira na preduzetništvo i teme u vezi sa ekonomijom. Radi i kao urednik i član uredništva i naučnog komiteta kao recenzent za nekoliko domaćih i međunarodnih časopisa.

Edvin Mirfazli (Edwin Mirfazli) je istraživač ustanove Akademske kompjuterske laboratorije za ekonomiju i Poslovnog fakulteta Univerziteta u Lampungu. Ima više od 100 citata u WoS-u i Scopusu i iskustvo u istraživanjima u oblasti poslovanja, društvenog računovodstva, društvene odgovornosti preduzeća i održivosti. Takođe je objavljivao članke u časopisu Emerald Scopus. Zamenik je direktora za spoljne poslove i korporaciju Univerziteta za postdiplomske studije u Bandar Lampungu, Indonezija i gostujući profesor i uvodničar za Međunarodnu univerzitetsku radionicu u Bolonji, Kampus Rimini, Italija.

Rodika Perčun (Rodica Perciun) poseduje habilitacionu disertaciju; profesorka je i načelnica Odeljenja za finansijska i monetarna istraživanja Nacionalnog instituta za ekonomska istraživanja (NIER) Ministarstva obrazovanja i istraživanja Republike Moldavije u Kišinjevu. Radi kao direktorka na mnogim projektima nacionalnih institucija; članica je nekoliko uredničkih odbora i ekspertkinja za nezavisnu evaluaciju projekata na nacionalnom i međunarodnom nivou. Takođe je članica mnogih naučnih odbora na međunarodnim naučnim konferencijama.

Elica Petrova (Elitsa Petrova) je vanredna profesorka u oblasti društvenih, ekonomskih i pravnih nauka, doktorka ekonomije i menadžmenta i doktorka nauka bezbednosti i odbrane na Nacionalnom vojnom univerzitetu Vasil Levski u Velikom Trnovu, Republika Bugarska. Koordinator je za Erasmus i ovlašćeni predstavnik za Horizon za univerzitet. Držala je predavanja na mnogim stranim univerzitetima i akademijama u Rumuniji, Republici Slovačkoj, Republici Češkoj, Republici Poljskoj i Mađarskoj.

Vjorika Popa (Viorica Popa) je doktorka ekonomije i koordinatorka-istraživačica na Odeljenju za finansijska i monetarna

istraživanja Nacionalnog instituta za ekonomska istraživanja (NIER) Ministarstva obrazovanja i istraživanja Republike Moldavije u Kišinjevu. Njene oblasti interesovanja u nauci su: bankarstvo i nebankarski sektor, implementacija strateškog menadžmenta unutar organizacija, osiguranje i javne finansije, cirkularna ekonomija, analiza opasnog otpada u Republici Moldaviji. Članica je timova u okviru nekoliko istraživačkih projekata; učestvuje u različitim nacionalnim i međunarodnim konferencijama u zemlji i inostranstvu, prezentujući u okviru svog stručnog polja. Članica je međunarodne konferencije koja je dobro pozicionirana u WoS-u.

Sabjasači Rat (Sabyasachi Rath) je profesor i dekan Vishwa Vishwani Grupe institucija u Hajderabadu, Indija. Ima preko 50 publikacija u domaćim i međunarodnim časopisima zastupljenim u Scopusu i drugim referentnim naučnim bazama. Predstavio je više od 100 istraživačkih radova na različitim konferencijama i bio koautor odnosno urednik konferencijskih zbornika, knjiga i belih knjiga. Takođe je glavni urednik časopisa Marketing Guru Business Media.

Roman Šperka podučava na Univerzitetu Šlezije u Opavi, Republika Češka. Ima više od 150 citata u WoS-u i Scopusu. Koordinator je za međunarodne konferencije koje se dobro kotiraju u WoS-u.

Marta-Kristina Suču (Marta-Christina Suci) je profesorka na Univerzitetu za ekonomske studije u Bukureštu i supervizorka za doktorande; angažovana je na Doktorskoj školi ekonomije 1, Fakulteta za teorijsku i primenjenu ekonomiju, na odeljenju za ekonomiju i ekonomsku politiku. Takođe, ona je stručna saradnica interdisciplinarne istraživačke grupe Rumunske akademije, kao i dopisna članica Rumunske akademije nauka, 9. komitet.

Wilfred Isioma Ukpere (Wilfred Isioma Ukpere) je trenutno profesor na odeljenju industrijske psihologije i upravljanja ljudskim resursima na Univerzitetu Johanezburg (UJ). Pruža značajan doprinos svojim teoretskim radom kroz istraživanja čiji su ishodi uglavnom usmereni na kritički stav o uticaju kapitalizma u periodu posle hladnog rata, pre svega u kontekstu ekonomija koje nastaju. Smatra se istaknutim istraživačem u oblasti upravljanja ljudskim resursima i razvojem, pre svega u polju globalizacije i njenog uticaja na upravljanje ljudskim resursima. Autor je tri knjige, dva poglavlja u knjigama, 37 konferencijskih prezentacija/zbornika i oko 230 članaka u časopisima ISI/WoS/CA (Thomson Reuters), IBSS (Proquest) Scopus (SCImago) i akreditovanih časopisa Južnoafričkog odeljenja za visoko obrazovanje i obuke (SA DoHET). Bio je najuspešniji istraživač Nacionalne istraživačke fondacije (NRF) na Fakultetu za biznis Univerziteta za tehnologiju Kejp Peninsula (CPUT). Od CPUT, UJ i NRF i Iona koledža u SAD primio je brojne nagrade za svoja istraživanja kao priznanje za istraživački doprinos. Njegovi citati na Google Scholar broje 2.369, dok je njegov Google Scholar H-index 25. Nedavno je primio i nagradu za životno delo izdavačke kompanije Macquis Who's Who?, sa sedištem u SAD, kao priznanje za doprinos u naučnoj oblasti kojom se bavi.

Katarina Valaskova predaje na Fakultetu za operacije, ekonomiju transporta i komunikacije Univerziteta Zilina. Ima više od 1.000 citata u WoS-u i Scopusu. Spoljni je koordinator međunarodnih konferencija koje se dobro kotiraju u WoS-u.

Agil Valijev je predavač na Univerzitetu za turizam i menadžment Azerbejdžana. Takođe, predaje na različitim evropskim univerzitetima u Kraljevini Švedskoj, Republici Finskoj, Kraljevini Noveškoj, Kraljevini Danskoj, Republici Austriji itd. Objavio je više od 80 publikacija u različitim međunarodnim časopisima. Član je ekspertske grupe u okviru Komisije za nauku i tehnologiju pri Konferenciji Ujedinjenih nacija za trgovinu i razvoj UNCTAD.

To su govornici sa Konferencije ICESBA 2021 koji su predstavili svoje radove i pružili značajan uvid tokom dana u kome su održane prezentacije i žive diskusije o zanimljivim i aktuelnim temama.

Vanredni profesor Kostin Lijanu, prorektor Univerziteta Spiru Haret, pročitao je poruku uprave organizatora i pozdravio učesnike, a onda je, u okviru plenarne sesije konferencije, prezentovao rad: Uloga centra za digitalne inovacije u digitalnoj transformaciji Evrope sa fokusom na veštačku inteligenciju.

Profesor Valentin Kuleto iz Visoke škole strukovnih studija za IT – ITS, Beograd, Republika Srbija, predstavio je rad Implementacija proširene realnosti u visokom obrazovanju, ispitivanje svesti studenata.

Profesor Maria Kovacova, sa Univerziteta u Zilini, Republika Slovačka, predstavila je rad Rad pametne fabrike, kognitivna automatizacija i analiza „Big Data“ u industriji za održivu proizvodnju interneta stvari.

Profesor Roman Šperka sa Univerziteta Šlezije iz Opave, Češka Republika, govorio je na temu Dobiti više na osnovu podataka realnog poslovanja, što je naišlo na veliko interesovanje kod svih učesnika konferencije.

Govorili su i: Dragan Ilić sa Univerziteta Privredna akademija u Novom Sadu, Republika Srbija, koji je govorio na temu Kako upotrebljavati pametne podatke da bi se dobio bolji povrat investicija u marketingu?; Milena Ilić, Fakultet savremenih umetnosti i ITS – Visoka škola strukovnih studija za IT, Beograd, Republika Srbija, koja je predstavila rad pod naslovom: Konkurentnost i inovativnost: Studija slučaja Srbije i Rumunije, a sa Univerziteta za turizam i menadžment Azerbejdžana, Baku, Republika Azerbejdžan, vanredni profesor doktor Agil Valijev je govorio o Primeni veštačke inteligencije za unapređivanje malih biznisa: Tri države kao studije slučaja.

Viorika Popa, iz Nacionalnog instituta za ekonomska istraživanja (NIER) Republike Moldavije, prezentovala je temu Upravljanje opasnim otpadom putem pametne digitalizacije; Viktorija Joradki iz Nacionalnog instituta za ekonomska istraživanja (NIER) Republike Moldavije prezentovala je temu Razvoj pametnog grada putem održive digitalne transformacije, a Tomas Kliestik, sa Univerziteta Zilina, Republika Slovačka, prezentovao je rad Upadljive determinante finansijske zaduženosti: Dokazi slovačkih i čeških preduzeća.

Posebno interesovanje je izazvao profesor Sabjasači Rat, dekan Vishwa Vishwani Grupe institucija u Hajderabadu, Indija, koji je predstavio rad pod naslovom Zora marketing 5.0: Simbioza agilnog i poboljšanog marketinga za precizna predviđanja.

U drugoj polovini prvog dana konferencije nastupili su sledeći govornici: profesor Stefano Amodio iz Instituta Teseo, Salerno, Italija – Organizaciona ekspertiza i donošenje odluka u korporativnim i složenim organizacijama; Melina Alegro iz italijanskog Ministarstva obrazovanja, univerziteta i istraživanja, Rim, Italija – Konflikta u radnim odnosima: Pregled. Kriza uloga u savremenom dobu: Radni odnosi između muškaraca i žena; Katarina Valaskova sa Univerziteta Zilina, Republika Slovačka, sa radom pod naslovom: Quo vadis, upravljanje zaradama? Analiza obrade determinanti u ambijentu centralne Evrope i Edwin Mirfazli, Univerzitet Lampung, Indonezija, koji je predstavio rad pod naslovom Otkrivanje društveno odgovornog poslovanja utiče na računovodstvene perspektive.

Kako se bližio kraj prvog dana konferencije, zanimljive radove su prezentovali Daniel Mejer, sa Univerziteta Johanezburg, Gauteng, Južnoafrička Republika – Ocena međusobnih odnosa između rizika, ekonomskog rasta i dobrog upravljanja zemljom: Slučaj Višegradske četvorke; Elica Petrova sa Nacionalnog vojnog univerziteta Vasil Levski u Velikom Trnovu, Republika Bugarska – Empirijska studija u realnom okruženju o problemima koji utiču na uspešnost studenata i kadeta u obrazovnom procesu; Baktibek Isakov sa kirgisko-turskog MANAS Univerziteta, Biškeke, Kirgiska Republika – Strukturisanje ideja putem trouglova podataka, hipoteza i naslova.

Prvi dan konferencije je završen nizom zaključaka, završnih komentara, zapažanja i čestitanja organizatorima i predsedavajućima međunarodne konferencije ICESBA 2021.

Drugog dana konferencije, 27. novembra 2021, održani su paneli-konferencije na kojima su moderatori bila sledeća četiri uvažena profesora USH:

PANEL 1, pod naslovom Pametno upravljanje i urbana ekonomija bazirana na znanju – moderator profesorka dr Daniela Pašniku, Univerzitet Spiru Haret, Fakultet ekonomskih nauka, Bukurešt, Rumunija i viši istraživač na Nacionalnom naučnom istraživačkom institutu za rad i socijalnu zaštitu, Bukurešt, Rumunija;

PANEL 2, pod naslovom Pametni marketing baziran na „Big Data“ – moderator profesor dr Luminika Jonesku, Univerzitet Spiru Haret, direktor odseka za ekonomske nauke Fakulteta ekonomskih nauka, Bukurešt, Rumunija;

PANEL 3, pod naslovom Algoritamski informacioni sistemi za računovodstvo na bazi analize podataka – moderator profesorka dr Elena Gurgu, Univerzitet Spiru Haret, Fakultet ekonomskih nauka, Bukurešt, Rumunija i zamenica glavnog urednika časopisa Anali Univerziteta Spiru Haret. Ekonomska serija;

PANEL 4, pod naslovom Veštačka inteligencija iza sistema interneta stvari na osnovu analize podataka – moderator vanredni profesor dr Mihaj Andronije, Univerzitet Spiru Haret, Fakultet ekonomskih nauka, Bukurešt, Rumunija.

Tokom panel sesija, oko 84 gosta iz 14 zemalja su se smenjivala u svojim prezentacijama, sa prosečnom dužinom izlaganja od 10 minuta praćena petominutnim blokovima pitanja i odgovora. Diskusija o naučnim radovima je bila dinamična i uspešna, u relaksiranoj atmosferi. Snimci svih panel sesija održanih 26. i 27. novembra 2021. su dostupni putem linka <http://icesba.eu/virtual.html>, na sajtu konferencije icesba.eu.

3. Relevantni aspekti iz apstrakta nekih od radova predstavljenih na konferenciji ICESBA 2021

Dozvolite nam da u sledećem delu rada predstavimo samo nekoliko važnih aspekata iz nekih radova predstavljenih na međunarodnoj konferenciji ICESBA 2021.

U svom naučnom radu pod naslovom **POUZDANOST SISTEMA INTERNETA STVARI BAZIRANIH NA ANALIZI PODATAKA**, Slavko Pokorni je istakao da je cilj ovog rada da pokaže da se pouzdanost interneta stvari (IoT) zasnovanog na podacima mora uzeti u obzir. Pouzdanost interneta stvari (IoT) zasnovanog na podacima je kompleksan problem jer taj sistem obuhvata hardver, softver, ljudski faktor i podatke. Kratko je analizirana pouzdanost svakog od ovih elemenata i predložena je jednačina za izračunavanje pouzdanosti sistema IoT baziranog na podacima. Veštačka inteligencija je takođe uključena. Pouzdanost je povezana sa dostupnošću podataka i mogućnošću održavanja hardvera i softvera, što je takođe objašnjeno. Ovaj rad je napisan uglavnom uz pozivanje na dve reference koje je autor ovog rada nedavno objavio [2] [3].

Autorke Maria ANDRONIJE (Maria ANDRONIE), Luminita IONESCU (Luminita IONESCU) i Irina DIŽMARESKU (Irina DIJMARESKU) u svom radu bavile su se time kako će četbotovi uticati na javni sektor i računovodstvo. Digitalna transformacija računovodstva će uticati na dnevne aktivnosti kompanija i ostaviće dubok trag na oblast zapošljavanja. Ovo istraživanje ima za cilj da predstavi komponente arhitekture visokog nivoa za četbotove u javnim službama i upotrebu četbotova u javnom sektoru. Poslednji deo ovog istraživanja analizira kako će čet botovi uticati na računovodstvo i kako će digitalizacija rada uticati na radna mesta. Veštačka inteligencija se razvija i upotreba čet botova u javnom sektoru donosi brojne koristi kada je reč o korisničkom interfejsu, vođenju dijaloga, beleženju interakcije, filtriranju podataka i povratnim informacijama od korisnika. U poslednjoj deceniji, došlo je do značajnog porasta interesovanja za veštačku inteligenciju, robote koji ne liče na ljude, četbotove i enkripciju. Tehnologija četbotova mogla bi da ubrza komunikaciju između savetnika i klijenata/građanstva, a u skorije vreme, između zaposlenih u računovodstvu i državnih vlasti. Nekoliko evropskih zemalja je uvelo čet botove koji pružaju javne usluge kako bi odgovorili na povećane zahteve građanstva ka administraciji za informacijama. Evropska unija podstiče upotrebu portala za otvorene podatke za poreze i potrebe prijavljivanja, ali takođe i za poboljšanje kvaliteta javnih usluga, čime se pospešuje efikasnost javnog sektora. Mreža četbotova mogla bi da unapredi sistem evropskih javnih službi u bliskoj budućnosti i omogući ekonomski rast [4].

Rodika PERČUN (Rodica PERCIUN) i Neli AMARFI-RAJLEAN (Neli AMARFI-RAILEAN) obavile su istraživanje **INDUSTRIJA 4.0 PREMA TRADICIONALNOJ EKONOMIJI U REPUBLICI MOLDAVIJI**. Napisale su zanimljivu studiju slučaja o znacima progressa digitalizacije u ekonomskim procesima tokom poslednje decenije koja je dovela do definisanja četvrte industrijske revolucije, nazvane Industrija 4.0. U situaciji u kojoj države u svetu ili uvode alate Industrije 4.0 ili postavljaju Industriju 4.0 kao razvojnu strategiju, autorke su izrazile zabrinutost do kog stepena je Republika Moldavija spremna da implementira nove digitalne alate, tj. da se suoči sa izazovima. Ovo istraživanje ima za cilj da ukaže kakvo je okruženje potrebno da bi se iskoristile inovacije Industrije 4.0 kako bi se obezbedio održivi razvoj. Članak ispituje međunarodno iskustvo u oblasti digitalizacije ekonomije nasuprot iskustvu Republike Moldavije, i sadrži analizu zakonskog okvira, dijagnozu na osnovu ekonomskih pokazatelja u odnosu na implementaciju IKT u ekonomiji Moldavije i primere dobre prakse drugih zemalja u oblasti Industrije 4.0. Ovo istraživanje je obavljeno u okviru državnog programa 20.80009.0807.22 Razvoj mehanizama cirkularne ekonomije za Republiku Moldaviju [5].

Sonja VUJOVIĆ, Tamara RAĐENović i Tanja VUJOVIĆ su napisale interesantan rad o **PRIMENI PROŠIRENE REALNOSTI U PROMOVISANJU HOTELA I TURISTIČKIH ATRAKCIJA GRADA NIŠA**. U vreme digitalne transformacije, posebno tokom pandemije koronavirusa, došlo je do promena u načinu predstavljanja turističke ponude potencijalnim klijentima. Tome su posebno doprinele tehnologije koje su omogućile da se turističke destinacije i hotelski kapaciteti približe korisnicima. Cilj ove studije je da identifikuje mogućnosti i izazove koje nudi proširena realnost kada se radi o stvaranju personalizovanog doživljaja korisnika, turističkom razvoju i većoj vidljivosti hotela i njihovih sadržaja na globalnom tržištu. Namera autora je da popuni prazninu u znanju i podigne svest o vrednosti primene proširene realnosti u turizmu. Na osnovu istraživanja sprovedenih u gradu Nišu, zaključeno je da je trenutna primena proširene realnosti u promociji hotela i turističkih atrakcija u ovom gradu nedovoljna i date su preporuke kako koristiti pogodnosti proširene realnosti u turističkoj promociji [6].

Elena GURGU (Elena GURGU), Raluca-Ileana ZORZOLIJU (Raluca-Ileana ZORZOLIU), Luminika PISTOL (Luminika PISTOL), Joana-Andrea GURGU (Ioana-Andreea GURGU), Kamelija UNGUREANU (Camelia UNGUREANU) i Gika NAI (Gica NAE) u svom radu pod naslovom **ODNOS IZMEĐU TEHNOLOGIJA ZASNOVANIH NA ANALIZI „BIG DATA“ I EFEKTIMA RADA STRATEGIJA UPRAVLJANJA PRIMENJENIH NA KOMPANIJE U INDUSTRIJI UGOSTITELJSTVA, TURIZMA I PUTOVANJA** razmatraju tehnologije zasnovane na analizi „big data“ koje su prihvaćene u turističkoj industriji, posebno tokom poslednjih godina, kao i najaktuelnije trendove bazirane na veštačkoj inteligenciji koja će iz osnova izmeniti putovanja u budućnosti. Tehnologije budućnosti u turističkoj industriji, koje su u suštini zasnovane na veštačkoj inteligenciji – AI, proširenoj realnosti – AR, mašinskom učenju – ML, virtuelnoj realnosti – VR i internetu stvari – IoT, jesu one koje diktiraju nove trendove u efikasnom strateškom upravljanju radom kompanija na turističkom

tržištu. Autorke su pokušale da ukažu na argumente, zajedno sa ciframa i statističkim podacima preuzetim iz međunarodnih statistika, ali su se takođe pozvale na stavove nekolicine autora iz celog sveta koji su, u svojim radovima objavljenim poslednjih godina u prestižnim međunarodnim časopisima, pisali o uticaju novih informacionih tehnologija na porast obrta u turizmu, na porast prodaje turističkih paket aranžmana, diversifikaciju turističke ponude za korisnike i lakše načine da se nađe savršena destinacija, da se lakše obavi rezervacija ili da se turistička usluga plati na mnogo pogodniji i brži način. Sve ovo ukazuje na ulogu koju napor kompanija i njihovo strateško upravljanje imaju, čija efikasnost je veća ako su prilagođeni zahtevima tržišta koje se stalno menja i razvija, a koje se u velikoj meri preselilo u online sferu, čemu u sve većoj meri doprinose softver i transformacije robotizacije, poput virtuelnih asistenata, kompjuterskih programa za analizu slika, pretraživača, sistemi za prepoznavanje slika, samohodnih vozila, dronova, interneta stvari. Međutim, može se videti da, uprkos obećavajućim svojstvima veštačke inteligencije, mnoge turističke kompanije ne uviđaju pun potencijal koji tehnologije zasnovane na analizi „big data“ nude [7].

Svetlana NOVAKOVIĆ CAREVIĆ, Jasmina BAŠIĆ i Irina DIŽMARESKU (Irina DIJMARESCU) sprovele su zanimljivo istraživanje o DIJAGNOSTICI UZ POMOĆ VEŠTAČKE INTELIGENCIJE U UPRAVLJANJU ZDRAVSTVOM. Zdravstvo trpi ogroman pritisak koji proističe iz činjenice da tu nema mesta za eksperimente ni greške, s obzirom na fatalne posledice ili nepredvidive ishode. Ovaj rad ima za cilj da predstavi specifičnosti upravljanja zdravstvom i upotrebu veštačke inteligencije da bi se poboljšala uspešnost u radu, zadovoljstvo poslom i, što je najvažnije, zdravlje pacijenata. To se postiže uvođenjem sistema veštačke inteligencije u zdravstvene ustanove [8].

Miljan PELEŠ, Svetlana JEVREMOVIĆ, Aleksandar SIMOVIĆ i Aleksandra HADŽIĆ su obavile zanimljivo istraživanje o MOGUĆNOSTIMA RAZVOJA I PRIMENE MOBILNIH APLIKACIJA ZA PREPOZNAVANJE OKRUŽENJA I TEKSTA I ČITANJE QR KODOVA KORIŠĆENJEM CAMERAX OKVIRA ZA ANDROID I OPREME ZA MAŠINSKO UČENJE. Napredak i razvoj digitalnih tehnologija rezultirao je potrebom da se različiti uređaji umreže na nivou aplikacija. Bežična komunikacija između različitih uređaja putem interneta dozvolila je mnoštvo mogućnosti da bi se podstakli kapaciteti korisnika. Svedoci smo vrtoglavih promena u kompjuterskoj tehnologiji i možemo zaključiti da se svrha jednog uređaja više ne može usko definisati. Mobilni telefoni prerastaju u personalne računare, današnjim televizorima se stalno dodaju nova svojstva, a kamere mogu da obrađuju i šalju fotografije. Ovo su samo neki od primera elektronskih uređaja koje svi koriste. Naravno, da bi jedan uređaj mogao da ostvari sve te funkcije, potrebno je da se u njega ugradi adekvatna hardverska infrastruktura, kao i neophodne softverske komponente koje povezuju operacije korisnika sa samim komponentama, tj. operativni sistem. Operativni sistem koji ovaj rad razmatra je operativni sistem Android, trenutno najpopularniji operativni sistem za pametne uređaje [9].

Milica JEVREMOVIĆ, Hana STEFANOVIĆ, Dušan STOJAKOVIĆ i Nada STALETIĆ imaju zanimljiv rad pod nazivom: MOŽEMO LI PREDVIDETI EFEKTE UPOTREBE INTERAKTIVNIH SVOJSTAVA VEB-SAJTA? Cilj ovog rada je određivanje očekivanih efekata na korisnike nakon uvođenja interaktivnih svojstava veb-sajta. Izvršeno je poređenje tri modela datih po Songu, Liu i Vuu, što daje ovom radu izuzetnu preciznost i dubinu istraživanju o konkretnom problemu. Doprinos ovog rada se ogleda u sveobuhvatnom i detaljnom osvrtu na ranija istraživanja o interaktivnosti i važnosti upotrebe veb-sajta, te ukazivanju na posebne efekte koje korisnici očekuju nakon što se uvedu interaktivna svojstva veb-sajta. Osim toga, doprinos rada se ogleda u prepoznavanju važnosti interaktivnih svojstava sajta za potrebe traženja posla / kurseva / obuke / prakse. Konačno, kod korisnika koji koriste interaktivne sajtove u poređenju sa sajtovima koji nisu interaktivni dolazi do značajnog porasta aktivnosti [10].

Roksana-Daniela PAUN (Roxana-Daniela PAUN) u svom radu pod naslovom PREGLED NEKIH ZAKONSKIH ASPEKATA TEHNOLOGIJA KOJE SE ZASNIVAJU NA VEŠTAČKOJ INTELIGENCIJI bavi se veštačkom inteligencijom, koja u sve većoj meri predstavlja izazov novih dekada i koja može da pomogne čoveku ili ga zameni. Odluka zavisi od onih koji, putem svog istraživanja, procene koliko nezavisnosti zapravo donose nove tehnologije koje je stvorio čovek. Izvan striktno naučnih aspekata koji su stvorili i razvili veštačku inteligenciju (VI), neki od tih aspekata su etički, moralni i konačno, ne najmanje važni, pravni. Već se odvijaju debate o ovoj temi online, gde su mišljenja podeljena između konzervativnih pitanja i inovacija po svaku cenu. Strah od novog može opstati iako se čovek već navikao na pomoć (Shazam, Waze, personalni asistenti). Ako VI već može da zameni muzičare koji izvode, na primer, Betovenove simfonije, koliko daleko se ta tehnologija može razvijati i gde bi bila granica nakon koje se čovek ne može zameniti? Ova studija daje kratku analizu nekih pravnih aspekata koji se moraju razmatrati u vezi sa širokom primenom tehnologija zasnovanih na VI, s aspekta poštovanja ljudskih prava i osnovnih sloboda, a takođe i u vezi sa odgovornošću u vezi sa VI (Ko je odgovoran i koje bi bile granice odgovornosti za VI.) [11].

Valentin KULETO, Milena ILIĆ, Aleksandra HADŽIĆ i Katarina RAKETIĆ, u svom radu pod naslovom IMPLEMENTACIJA PRODUŽENE REALNOSTI U VISOKOM OBRAZOVANJU, ISPITIVANJE SVESTI STUDENATA opisuju radove i potvrđuju koristi primene produžene realnosti (XR) u visokom obrazovanju. Izazovi koji se pojavljuju u domenu sveobuhvatne, tzv. produžene stvarnosti (XR) (kao što su virtuelna realnost (VR), proširena realnost (AR) i mešovita realnost (MR)), kao i ono što su njihovi uzroci i rešenja, biće takođe obrađeni. Predstavljena poglavlja uključuju perspektivu tehnologije, dizajna, ljudskog faktora, različitih tehnologija i ideja. XR se pre svega primarno ili isključivo fokusira na prikaz/sliku, s obzirom na to da ne uključuje druge modalitete kao što je audio, taktilna komponenta, miris ili dodir. Stoga, primarni fokus je na koristi korišćenja XR, kroz različite discipline koje se ukrštaju sa visokim obrazovanjem, tamo gde je to potrebno. U celini, ova studija stremi da pruži kompletan uvid u izazove, mogućnosti i buduće XR trendove koji bi se primenjivali u obrazovnim institucijama. Primarno istraživanje u formi analitičkog istraživanja koje je uključivalo 83 ispitanika pokazalo je visok stepen svesti o XR među studentima odabrane visokoškolske institucije i upotrebu ove tehnologije u svakodnevnom životu studenata, i uticaj starosti učesnika istraživanja na upotrebu XR. Da bi se utvrdilo da li postoji korelacija između upotrebe AR (proširene realnosti) i starosti ispitanika, korišćen je Spirmanov koeficijent, statistika koja nije zasnovana na parametrima, tj. koja se bazira na rangiranom posmatranju. Softver za statističku obradu podataka i analizu IBM SPSS je korišćen da bi se izračunao Spirmanov koeficijent korelacije. Na osnovu opservacije uzorka i primenjenog statističkog zaključivanja, ne može se tvrditi da postoji direktna korelacija između upotrebe proširene stvarnosti AR u svakodnevnom životu ispitanika i njihove starosti. Međutim, rezultati pokazuju visok stepen svesti o XR kod ispitanika (78,31%); ali stepen upotrebe ove tehnologije u svakodnevnom životu je skoro jednako raspoređen: 34,94% ispitanika je koristi, dok je 33,73% ne koristi, a možda je koristi 31,33% ispitanika koji nisu svesni te tehnologije [12].

Marija Nikolić TOŠOVIĆ i Violeta JOVANOVIĆ, u svom radu pod naslovom ANALIZA PREDUZETNIČKIH NAMERA KOD STUDENATA MENADŽMENTA U TIMOČKOM REGIONU – PREGLED STAVOVA I MIŠLJENJA bave se sektorom malih i srednjih preduzeća i preduzetnika (MSP), koji bi mogao imati ključnu ulogu za dalji nacionalni ekonomski rast Srbije kroz zapošljavanje, povećanu konkurentnost i izvoz, ali

takođe i za rešavanje problema nejednakog razvoja regiona. Jedan od ekonomski i demografski najnerazvijenih regiona Srbije je timočki region. Ono što je svojstveno za ovaj region jeste redukovana investiciona aktivnost sektora MSP. Povećavanje privlačnosti ovog regiona za nove preduzetnike i investitore i porast konkurentnosti lokalnih preduzetnika stvorice nove, atraktivne i stabilne poslove, što će potom učiniti da se u regionu zadrži kvalifikovana radna snaga. Ovaj rad omogućava da se čuje glas budućih nosilaca ekonomskih aktivnosti u ovom konkretnom regionu i predstavlja prvo istraživanje o preduzetničkim stavovima, mišljenju i namerama mladih ljudi u ovom delu Srbije. U ovoj analizi preduzetničkih namera učestvovalo je 199 studenata završne godine osnovnih i master studija menadžmenta u timočkom regionu. Dobijeni rezultati istraživanja ukazuju na to da studenti uglavnom imaju preduzetničkih namera i da ljudi u njihovom neposrednom okruženju uglavnom imaju pozitivan stav o preduzetništvu. Ispitanici veruju da poseduju neophodna teoretska znanja i veštine, ali ne i praktična znanja. Rezultati istraživanja ukazuju na neophodnost pomeranja fokusa obrazovanja sa strogo akademskog na praktičan nivo i na vezu obrazovnih institucija i privrede, odnosno na bolje veze između samih preduzetnika, kao i na hitnu potrebu za aktiviranjem preduzetničkih udruženja [13].

Strahinja ĐORĐEVIĆ, Svetlana JEVREMOVIĆ, Jovana TOŠIĆ i Nina STOJANOVIĆ u svom radu pod naslovom VEB-APLIKACIJE ZA PAMETNU KUĆU: DIZAJN I IMPLEMENTACIJA UZ KORIŠĆENJE JAVA EE, MVC OKVIRA I ARDUINO MIKROKONTROLERA bave se automatizacijom našeg okruženja kao rezultatom užurbanog modernog načina života, što je za ishod imalo aplikaciju koja bi pojednostavila i olakšala svakodnevni život. Cilj rada bio je da istraži mogućnosti da se dizajnira i implementira veb-aplikacija Pametna kuća, koja bi olakšala kontrolisanje uređaja u kući svim korisnicima, a posebno onima kojima je kretanje delimično ili potpuno onemogućeno. U prvom delu rada, teoretski su obrađene tehnologije koje su korišćene za aplikaciju Pametna kuća. Istraživanje je potkrepljeno crtežima i tabelama. Dokumentacija o dizajnu aplikacije i njenoj implementaciji je obrađena Lermanovom metodom. Istovremeno, teoretska analiza primenjene tehnologije upućuje na literaturu autoriteta u istraživačkoj oblasti naprednog koncepta Java i Java EE platforme i razvojnog sistema otvorenog koda Arduino mikrokontroler, koji omogućavaju modularnost i laku modifikaciju. Istraživanje ispituje slučajeve primene aplikacije kada je kreator aplikacije korisnik, odnosno slučajeve upotrebe aplikacije kada je kreator admin. Dalje, posmatrane su sistemske operacije koje treba napraviti i posmatrati. Ovo prati proces implementacije aplikacije, u kome se istovremeno odvija testiranje, što predstavlja poslednju, konačnu fazu razvoja softverskog sistema da bi se omogućilo rešavanje problema [14].

Vitorija JORDAKI (Victoria IORDACHI) u svom radu pod naslovom RAZVOJ PAMETNOG GRADA UZ ODRŽIVU DIGITALNU TRANSFORMACIJU bavi se konceptom pametnog grada, za koji se lokalne uprave sve više interesuju, koje predstavljaju jedno od rešenja za različite gradske probleme, počev od urbanizacije pa sve do ekoloških izazova. U ovakvim uslovima, pristupi upravljanju gradskim razvojem se postepeno preispituju i u sve većoj meri se oslanjaju na napredna tehnološka rešenja, digitalizaciju i korišćenje platformi. Danas, digitalno unapređivanje gradova postaje glavna operativna/politička opcija u mnogim zemljama, s obzirom na to da se tako postižu, s jedne strane, ušteda i efikasnost u funkcionisanju usluga i u rešavanju problema, a sa druge strane, brzina i transparentnost u donošenju odluka. Cilj ovog rada je da analizira ulogu pametnih tehnologija u promovisanju održivosti i koncepta pametnih gradova, kao i da ustanovi odnos između ova dva koncepta. Da bi se to postiglo, primenjene su metode naučnog istraživanja poput analize i sinteze posebne literature u oblasti cirkularne ekonomije, pametnih gradova, pametnih tehnologija, induktivno i deduktivno zaključivanje, kritička analiza materijala. Održivi razvoj se bazira na interakciji tri aspekta razvoja koji su uzajamno zavisni i utiču jedan na drugi. Ta tri aspekta razvoja su ekonomski, društveni i ekološki. Tako, cirkularni koncept ekonomije može obezbediti nova rešenja koja ostvaruju veći uticaj na sisteme pametnog grada putem nove mobilnosti, poboljšanja energetske efikasnosti i pametnih ekoloških rešenja [15].

Viorika POPA (Viorica POPA) i Mihail Cöbanu (Mihail CIOBANU), u svom radu naslovljenom UPOTREBA PAMETNE DIGITALIZACIJE ZA UPRAVLJANJE OPASNIM OTPADOM, bave se globalnim informatičkim društvom koje se brzo uvećava. Istovremeno, porast kupovne moći, urbanizacija i industrijalizacija u mnogim zemljama u razvoju dovela je do porasta količine proizvoda koji se nalaze na tržištu i potom kupuju, te stvaraju ogromne količine toksičnog otpada. Stoga, digitalizacija i povezanost su ključni za omogućavanje ostvarenja Ciljeva održivog razvoja. Tranzicija ka svetu koji je sve više digitalizovan takođe uključuje brojne rizike usled neracionalne potrošnje resursa i lošeg upravljanja otpadom. Autori smatraju da je rešavanje problema opasnog otpada moguće uz primenu moderne pametne tehnologije u upravljanju otpadom, a putem primene digitalizacije u rukovanju otpadom, popraviće se zdravlje na celoj planeti, smanjiće se negativan uticaj emisije zagađivača u naše okruženje, i biće obnovljeni najvažniji ekosistemi kako bi se obezbedila naša dugoročna održivost. Na taj način, upotreba otpada kao resursa je neophodna kako bi se smanjila potreba za ekstrakcijom novih resursa. Ova studija je razvijena u okviru državnog programa 20.80009.0807.22 Razvoj mehanizama za formiranje cirkularne ekonomije u Republici Moldaviji [16].

Olga TIMOFEJ (Olga TIMOFEI) u svom radu naslovljenom SVEST O PRINCIPIIMA CIRKULARNE EKONOMIJE U MOLDAVSKIM KOMPANIJAMA bavi se cirkularnom ekonomijom kao novim pristupom odgovornom i cikličnom korišćenju prirodnih resursa, gde bi cilj ekonomije trebalo da bude smanjivanje uticaja na čovekovo okruženje i podsticanje ekonomije. Rešavanje problema čovekovog okruženja zajedno sa promovisanjem održivog razvoja nikad nije bilo tako aktuelno kao danas. Jedna od osnovnih strategija tranzicije ka cirkularnoj ekonomiji je bolje upravljanje otpadom, pre svega zbog ograničenih prirodnih resursa na globalnom nivou, kao i potrebe da se smanji njihovo iscrpljivanje. Republika Moldavija, slično drugim zemljama u svetu, godišnje proizvede ogromne količine otpada, a značajan deo toga stvaraju kompanije i preduzeća. Kako bi u proteklih godinama ekonomski akteri imali odgovornost u ovoj sferi, državne vlasti su preduzele neke korake, ali oni nisu ostavili vidljiv uticaj na situaciju u ovoj oblasti. S obzirom na to da se adaptacija na model cirkularne ekonomije odvija na različitim nivoima, uključujući i individualni nivo, bilo kao vlasnik ili zaposleni u kompaniji, preduzeto je istraživanje kako bi se odredio stepen svesti o principima cirkularne ekonomije kod onih koji su uključeni u realni sektor ekonomije zemlje. Rezultati intervjua jasno pokazuju da najveći napor kada je reč o podizanju svesti i osnaživanju kompanija tek treba da se ulože i da će biti potrebno izvesno vreme za prelazak na cirkularnu ekonomiju u Republici Moldaviji [17].

Velinka TOMIĆ i Svetlana ANĐELIC, u svom radu pod naslovom PROIZVODNJA ELEKTRIČNE ENERGIJE IZ OBNOVLJIVIH IZVORA ENERGIJE U REPUBLICI SRPSKOJ, konstatuju da je za smanjivanje emisije štetnih gasova za najmanje 55% do 2030. potrebno da se veći udeo obnovljivih izvora energije i veći stepen energetske efikasnosti integrišu u energetske sistem. Republika Srpska proizvodi električnu energiju iz različitih izvora. Termoelektrana Ugljevik, relativno mala elektrana, emituje nezamislivu količinu sumpor-dioksida. Imajući na umu udeo energije koji se dobija iz fosilnih goriva, pitanje za Republiku Srpsku je – kako da obezbedi dovoljno

energije za buduće generacije. Razvoj proizvodnje iz obnovljivih izvora energije danas predstavlja osnovni izazov za kreatore politike u Republici Srpskoj. Ova transformacija će poboljšati zdravlje i zadovoljstvo ljudi, stvoriti nove poslove, generisati investicije i inovacije, smanjiti nedostatak energije i zavisnost od uvoza energije i obezbediti sigurno snabdevanje [18].

Milena ILIĆ P, Nevenka POPOVIĆ ŠEVIĆ, Marko RANKOVIĆ i Roksana BUČEA-MANEA-TONIS (Rocsana BUČEA-MANEA-TONIS) u svom radu pod naslovom KONKURENTNOST I INOVATIVNOST. STUDIJE SLUČAJA SRBIJE I RUMUNIJE bave se netehnološkim inovacijama koje potiču iz sektora koji imaju kapacitet da primene znanje koje donose strane kompanije i trgovinski partneri. Zelena nabavka se pokazala kao osnovni faktor koji stimulise inovacije i ekonomsku fleksibilnost. U kompanijama jugoistočne Evrope se često nailazi na društvenu odgovornost, visok stepen kompetencija, agilni operativni menadžment. Rumunija se okrenula zelenoj nabavci i preduzela korake ka agilnom menadžmentu kako bi izvršila pozitivan uticaj na produktivnost sa niskim karbonskim otiskom. S druge strane, Srbija nije imala pristup fondovima za FP7 kako bi investirala u istraživanje i razvoj i eko-inovacije, što se odrazilo kroz njenu niskorangiranu poziciju kad je reč o globalnom indeksu inovacija. Ovaj rad se bavi konkurentnošću i inovacijama u okviru primera studije slučaja o Srbiji i Rumuniji, istražuje sličnosti i razlike i daje preporuke. Kompetitivnost i inovacije su posmatrani u kontekstu cirkularne ekonomije [19].

Juliana Petronela GARDAN (Iuliana Petronela GÂRDAN), Daniel Adrian GARDAN (Daniel Adrian GÂRDAN), Klaudia Gabriela BAIČU (Claudia Gabriela BAICU) i Daniel Konstantin ŽIROVEANU (Daniel Constantin JIROVEANU), u svom radu SISTEMATSKI POGLED NA POSLOVNO PREISPITIVANJE U KONTEKSTU ODRŽIVOSTI LANACA NABAVKE, bave se krizom koju je stvorila pandemija, koja je donela izazove za industriju ugostiteljstva na više nivoa. Ne bave se samo smanjenim brojem gostiju i nestabilnošću protoka turista, pored totalnog zatvaranja od početka pandemije, već se dotiču i sposobnosti za upravljanje i bavljenje marketingom kompanija koje se bave ugostiteljstvom kako bi se suočile sa dubokim promenama duž lanca snabdevanja. Ovaj rad daje sistematski pregled sa ciljem da se naglase glavni pravci u kojima se, na osnovu naučne literature iz ove oblasti, analiziraju kompleksna pitanja primene održivosti nabavnih lanaca u ugostiteljstvu. Autori su odabrali samo članke iz časopisa, konferencijskih zbornika i indeksiranih knjiga u okviru baze podataka WoS iz poslednjih pet godina. Rezultati analize pokazuju da primena principa koji se odnose na implementaciju održivosti duž lanca snabdevanja, u kombinaciji sa odgovarajućim održivim upravljanjem ljudskim resursima i specijalnim uvidom u upravljanje odnosima sa korisnicima, nudi kompanijama u ovom polju izvestan broj strateških instrumenata za borbu sa tim ogromnim izazovima koje je nametnula pandemija. Poslovni modeli za budućnost adaptirani prema postpandemijskoj ekonomiji treba da naglase održiv vid ponašanja gostiju i lanca nabavke i dostave zasnovan na pametnoj i inovativnoj saradnji između organizacija u tom lancu [20].

Hepines Ozioma OBI-ANIKE (Happiness Ozioma OBI-ANIKE) i Wilfred Isioma UKPERE (Wilfred Isioma UKPERE) u svom radu pod naslovom PROJEKCIJA POTRAŽNJE KAO PRAVO SREDSTVO ZA VISOKU EFIKASNOST U UPRAVLJANJU INDUSTRIJOM U NIGERIJU istražuju prednosti projekcije potražnje i prikazuju je kao pravo sredstvo povećavanja upravljačke efikasnosti u industriji Nigerije. Ova studija nastoji da ukaže na to da je primena projekcije potražnje pravi način da se gubici svedu na minimum, maksimalno uveća profit i oporavi i oživi napačena i neuspešna industrija Nigerije. Pod posebnim okolnostima, proizvodnja i prodaja krečnjaka su uzeti kao ilustracija. Korišćeni su metod najmanjeg kvadrata i statistika t-ispitivanja da bi se analizirala proizvodnja i prodaja krečnjaka u Nigeriji 2001–2010. Takođe su napravljene projekcije za proizvodnju i prodaju za period 2011–2014. Godina 2011. je uzeta kao početna godina da bi se uporedila sa aktuelnom realizacijom podataka o proizvodnji i prodaji krečnjaka. Ustanovljeno je da nije bilo velike razlike između projektovanih i realnih vrednosti za proizvodnju i prodaju krečnjaka u početnoj godini, što je potvrdilo efikasnost projekcije potražnje. Između ostalog, preporučeno je da se menadžeri u velikoj meri oslanjaju na projekciju potražnje u svom radu [21].

Raluca Jonela KRETOJU (Raluca Ionela CRETOIU), Anka UNGUREANU (Anca UNGUREANU), Adrian UNGUREANU (Adrian UNGUREANU), Ana Maria MIHALI (Ana Maria MIHALI) i Silvia RASKU PISTOL (Silvia RASCU PISTOL), u svom radu pod naslovom NOVI VIDOVI POSLOVANJA RAZVIJENI U TOKU PANDEMIJE govore o uticaju koji je COVID-19 imao, posebno na poslovanje; kako se nije mogao predvideti, predstavljao je pravi izazov za preduzetnike, od kojih se moglo učiti, koji su bili odlučni da razviju svoju kreativnost, da pronađu rešenja i predloge za preživljavanje. Pandemija je otvorila brojne mogućnosti za vlasnike biznisa kako bi zadovoljili potrebe i zahteve potrošača koji se stalno menjaju. Mogućnosti su identifikovali i iskoristili samo oni preduzetnici koji misle unapred, a koji na kraju postaju uspešni preduzetnici. Na osnovu podataka Biroa za popis u SAD, više od 4.4 miliona novih poslova je stvoreno u SAD 2020 – što je najveći broj novih poslova zabeležen do danas. Pojava nekoliko tipova poslova koji su se razvili tokom pandemije bila je moguća upravo zahvaljujući digitalizaciji i razvoju tehnologije [22].

Snežana ŽIVKOVIĆ, Ivana ILIĆ KRSTIĆ, Aleksandra ILIĆ PETKOVIĆ, Marija STOJILJKOVIĆ i Miodrag MILENOVIĆ u svom radu pod naslovom ZADOVOLJSTVO NA POSLU KOD MEDICINSKIH SESTARA TOKOM PANDEMIJE COVID-19 bave se zadovoljstvom na poslu kod medicinskih radnika, koji su neophodan element u pružanju zdravstvenih usluga. Obimno empirijsko iskustvo potkrepljuje uzročno-posledičnu vezu između zadovoljstva na poslu zaposlenog i pacijentove bezbednosti i kvaliteta pružene nege. Ovaj rad razmatra zadovoljstvo na poslu kod medicinskih sestara tokom pandemije COVID-19 uzimajući u obzir godine staža, starost, profesionalno obrazovanje, radno mesto, mogućnost napredovanja, odnos sa nadređenima i organizaciju posla. U prikupljanju podataka primenjeno je standardizovano istraživanje sa skalom o zadovoljstvu na poslu. Istraživanje je obavljeno između 23. juna i 13. jula 2020. i njime je obuhvaćeno 27 od 50 medicinskih sestara koje su radile u bolnici u COVID režimu u Leskovcu, Srbija. Rezultati su pokazali da su zaposleni sa kraćim radnim stažom bili zadovoljniji nego oni iskusniji. Rezultati ukupnog zadovoljstva prema korišćenoj skali pokazuju da je 2,6% ispitanika veoma nezadovoljno, 28,3% nije ni zadovoljno ni nezadovoljno, dok je samo 9,3% izuzetno zadovoljno. Jedan od glavnih razloga za ovakvu distribuciju odgovora je odsustvo mogućnosti da se napreduje u karijeri. Ovo istraživanje je pokazalo da su organizaciona posvećenost, zadovoljstvo na poslu i godine staža značajni prediktori uspešnosti rada medicinskih sestara. [23].

Raluca ZORZOLIJU (Raluca ZORZOLIU), Mariana JATAGAN (Mariana IATAGAN) i Elena GURGU (Elena GURGU) u svom radu pod naslovom EKONOMSKA KRIZA IZAZVANA PANDEMIJOM COVID-19 bave se činjenicom da je i tokom četvrtog talasa pandemije potražnja za robom i dalje bila intenzivna, a vrednosti akcija i nekretnina su obarale rekord za rekordom. S druge strane, zagušenja u svetskim lukama, prekidi u proizvodnji zbog krize sa sirovinama, komponentama i mikroprocesorima, ili eksplozija cena energenata u Evropi su manje svetli aspekti perioda u kome živimo. Pandemija se još ne bliži kraju, ali od jeseni 2020, kada je većina ograničenja za kretanje bila ukinuta, svetska populacija se neprimetno kretala od racionalnog trošenja do rasipanja. Inflacija na kraju godine će se više nego udvostručiti, kada se uporedi sa poslednjim kvartalom 2020, sudeći po projekciji Narodne banke Rumunije. Po mišljenju nekih analitičara, kao što je Valentin Tataru, glavni ekonomista ING Rumunije, inflacija može da dostigne 6% već na jeseni. Novčana

injekcija ekonomiji, u teoriji, mogla bi početi odmah nakon odobrenja Nacionalnog plana za oporavak. Skoro 30 milijardi evra koje bi pomogle u sferama kao što su zdravstvo, obrazovanje, energetika, građevinarstvo i transport u toku narednih šest godina, kao i tržište kapitala, trebalo bi da pruži sigurnost čak i u slučaju najgoreg scenarija. Međutim, kriza rada, čije rešenje se ne vidi čak ni na srednji rok, predstavlja pravu tempiranu bombu koja može potkopati ekonomski rast, a osim toga i sposobnost evropskih fondova da to ublaže. Oblasti u kojima postoji veliki nedostatak specijalizovane radne snage su dobro poznate – građevinarstvo, ugostiteljstvo, zdravstvene usluge i tehnologija [24].

Foluzo Filip ADEKANMBI (Foluso Philip ADEKANMBI) i Wilfred Izioma UKPERE (Wilfred Isioma UKPERE) u svom radu pod naslovom UOČENA ORGANIZACIONA KULTURA, PODRŠKA KOLEGAMA, USPEŠNOST U RADU I DEMOGRAFIJA ZAPOSLENIH SU U KORELACIJI SA ORGANIZACIONOM POSVEĆENOŠĆU istražuju uočenu kompanijsku kulturu, podršku kolegama, uspešnost u radu, demografiju zaposlenih u korelaciji sa posvećenošću organizaciji u okviru nigerijske proizvodne industrije. Ovaj uzorak je uzet iz deset proizvodnih organizacija u državama Ojo i Lagos u Nigeriji. Preuzeti podaci su analizirani i predstavljeni u vidu tabela. U radu je primenjen presečni pristup, uz nasumičnu distribuciju upitnika. Od 500 upitnika, 476 su bili pogodna za ispitivanje i analizu pomoću statsitičkog paketa za društvene nauke (SPSS vs.27). Ciljevi ovog rada su bili da se otkrije da li postoji korelacija između uočene kompanijske kulture, podrške kolegama, uspešnosti u radu, demografije zaposlenih i posvećenosti organizaciji i da se odredi kako posvećenost organizaciji može biti pojačana i dosledna u okviru nigerijskog proizvodnog sektora. Sadašnji rezultati su utvrdili jaku i značajnu pozitivnu korelaciju između uočene kompanijske kulture, podrške kolegama, uspešnosti u radu, demografije zaposlenih i posvećenosti organizaciji u okviru nigerijske proizvodne industrije. Stoga, menadžment proizvodne industrije treba da obezbedi dobru i doslednu strategiju koja će učiniti da zaposleni budu posvećeni kulturi kompanije, da podstaknu saradnju među zaposlenima i povećaju uspešnost rada [25].

Kleopas FORE (Cleopas FORE) i Wilfred Izioma UKPERE (Wilfred Isioma UKPERE) u svom radu pod naslovom UBLAŽAVANJE NEPOVOLJNIH EFEKATA GLOBALIZACIJE NA ODNOS MEĐU ZAPOSLENIMA U ZIMBABVEU bave se činjenicom da je globalizacija povezana sa ubrzanim ukidanjem ograničenja i povlačenjem državne uprave iz nadzora na radnim mestima (Sweeney, 2004). Pojava globalizacije prisilila je organizacije u Zimbabveu da se bave posledicama kao što su gubitak tržišta, reakcija na konkurenciju, tehnološke i zakonske promene. Ova pometnja dovela je, između ostalog, do promena u politici ljudskih resursa, kompenzaciji zaposlenih i poslovnoj strategiji. To je, pak, dovelo do ogromnih promena u odnosima između poslodavaca i zaposlenih, kao i između zaposlenih i njihovih sindikata. Imajući u vidu ova događanja, ciljevi ovog rada su da identifikuje izazove do kojih je došlo usled globalizacije u odnosu na mogućnost zapošljavanja u Zimbabveu, kao i da ponudi mehanizme za ublažavanje negativnih efekata globalizacije. Kvalitativno fenomenološko istraživanje je primenjeno uz korišćenje intervjuva, beležaka istraživača sa terena i sećanja da bi se sakupili podaci o iskustvima učesnika. Rezultati su analizirani pomoću Nvivo 10 i manualnog kodiranja. Rezultati su identifikovali šest glavnih izazova: (1) sukob između poslodavaca i zaposlenih, (2) gubljenje demokratije zaposlenih, (3) marginalizacija zaposlenih, (4) intenzivniji sukobi, (5) generalno nezadovoljstvo svih strana, (6) razjedinjenost između sindikata i zaposlenih. Studija predlaže četiri strategije za ublažavanje situacije: kontekstualizaciju globalizacije; obuku i edukaciju; povećano uključivanje zaposlenih; primenu dijaloga i komunikacije. Uz uzimanje ovih faktora u obzir, pravična globalizacija je moguća.

4. Zaključci

Šesto izdanje međunarodne onlajn konferencije ICESBA, pod nazivom Pametna urbana ekonomija zasnovana na „big data“, organizovano je u Bukureštu, na Fakultetu ekonomskih nauka, i bilo je veoma uspešno. Ovaj skup pružio je priliku da se diskutuje o naučno-istraživačkim temama i da se razmene sjajne ideje, bilo kao začetak drugih skupova ili početak budućeg partnerstva u akademskim krugovima.

Nadamo se da je vam je značajan broj radova sa ove konferencije privukao pažnju i da ste poželili da ih pročitate. Takođe, čvrsto verujemo da su svi članci zanimljivi i da zaslužuju pažnju onih koji se zanimaju za specijalna pitanja globalne ekonomije i „big data“.

Ako su vam se članci dopali, molimo vas da posetite veb-sajt konferencije na adresi icesba.eu ili sajt časopisa ASHUES, gde se nalaze svi radovi sa konferencije, objavljeni u celosti, u svojim kompletnim verzijama, ili su upravo u procesu objavljivanja – <http://anale-economie.spiruharet.ro/>. Ako želite da napišete članak za ASHUES, pozivamo vas da izložite svoje ideje u novoj studiji, koja bi mogla biti objavljena u našem indeksiranom časopisu [27].

Konačno, nadajući se da vam je međunarodna konferencija ICESBA 2021 bila zanimljiva, pozivamo vas da učestvujete i u njenim budućim izdanjima, kao i da svoje komentare i sugestije uputite na icesba@spiruharet.ro i, naravno, pošaljete svoj rad za objavljivanje putem onlajn sistema za predaju radova, koristeći sledeći link časopisa ASHUES: <http://anale.spiruharet.ro/index.php/economics/login> [28] ili da uputite zahtev za kreiranje naloga i dobijanje pristupnih podataka radi objavljivanja vašeg rada u časopisu ASHUES na zvaničnu imejl-adresu: ashues@spiruharet.ro.

Reference

1. ICESBA 2021 [cited 2021 Dec 15]. Available from: <http://icesba.eu/Index.html>
2. GURGU, E. (2021). "Foreword." *Annals of Spiru Haret University. Economic Series*, 21(4), 21–39, doi: <https://doi.org/10.26458/2140>
3. POKORNI, S. (2021). "The Reliability of Data-driven Internet of Things Systems." *Annals of Spiru Haret University. Economic Series*, 21(4), 43–52, doi: <https://doi.org/10.26458/2141>
4. ANDRONIE, M., IONESCU, L., & DIJĂRESCU, I. (2021). "How Chatbots Will Impact Public Sector and Accounting." *Annals of Spiru Haret University. Economic Series*, 21(4), 53–61, doi: <https://doi.org/10.26458/2142>
5. PERCIUN, R., & AMARFII-RAILEANU, N. (2021). "Industry 4.0 versus Traditional Economy. Republic of Moldova Case Study." *Annals of Spiru Haret University. Economic Series*, 21(4), 63–78, doi: <https://doi.org/10.26458/2143>
6. VUJOVIĆ, S., RAĐENOVIĆ, T., & VUJOVIĆ, T. (2021). "The Application of Augmented Reality in Promoting Hotels and Tourist Attractions of the city of Niš." *Annals of Spiru Haret University. Economic Series*, 21(4), 79–96, doi: <https://doi.org/10.26458/2144>
7. GURGU, E., ZORZOLIU, R.I., PISTOL, L., GURGU, I.A., UNGUREANU, C., & NAE, G. (2021). "The Relationship Between Big DataDriven Technologies and Performance Management Strategies Applied to Companies in the Hospitality, Tourism & Travel Industry." *Annals of Spiru Haret University. Economic Series*, 21(4), 97–136, doi: <https://doi.org/10.26458/2145>
8. NOVAKOVIĆ CAREVIĆ, S., BAŠIĆ, J., & DIJĂRESCU, I. (2021). "AI-Assisted Diagnostics in Health Management." *Annals of Spiru Haret University. Economic Series*, 21(4), 137–143, doi: <https://doi.org/10.26458/2146>
9. PELEŠ, M., JEVREMOVIĆ, S., SIMOVIĆ, A., & HADŽIĆ, A. (2021). "Possibilities for Developing and Implementing a Mobile Application for Recognizing the Shape of the Environment, Text, and Reading QR Codes Using the Android Camerax Framework and the Machine Learning KIT." *Annals of Spiru Haret University. Economic Series*, 21(4), 163–179, doi: <https://doi.org/10.26458/2148>
10. JEVREMOVIĆ, M., STEFANOVIĆ, H., STOJAKOVIĆ, D., & STALETIĆ, N. (2021). "Can We Predict the Effects of Using the Interactive Features of the Website?." *Annals*

- of Spiru Haret University. Economic Series, 21(4), 181–192, doi: <https://doi.org/10.26458/214>
11. PĂUN, R.D. (2021). "Overview of Some Legal Aspects of Technologies Based on Artificial Intelligence." Annals of Spiru Haret University. Economic Series, 21(4), 193–209, doi: <https://doi.org/10.26458/21410>
 12. KULETO, V., ILIĆ, M., HADŽIĆ, A., & RAKETIĆ, K. (2021). "The Implementation of Extended Reality in Higher Education, Examining Students' Awareness." Annals of Spiru Haret University. Economic Series, 21(4), 211–225, doi: <https://doi.org/10.26458/21411>
 13. TOSOVIC, M.N., & JOVANOVIĆ, V. (2021). "The Analysis of Entrepreneurial Intention of Management Students in the Timok Region –Overview of Attitudes and Opinions." Annals of Spiru Haret University. Economic Series, 21(4), 227–243, doi: <https://doi.org/10.26458/21412>
 14. ĐORĐEVIĆ, S., JEVREMOVIĆ, S., TOŠIĆ, J., & STOJANOVIĆ, N. (2021). "Smart house web application: design and implementation using Java EE, MVC framework and Arduino microcontroller." Annals of Spiru Haret University. Economic Series, 21(4), 245–260, doi: <https://doi.org/10.26458/21413>
 16. IORDACHI, V. (2021). "Smart City Development by sustainable digital transformation." Annals of Spiru Haret University. Economic Series, 21(4), 261–271, doi: <https://doi.org/10.26458/21414>
 - POPA, V., & CIOBANU, M. (2019). "Using Smart Digitization in Hazardous Waste Management." Annals of Spiru Haret University. Economic Series, 21(4), 273–290, doi: <https://doi.org/10.26458/21415>
 17. TIMOFEI, O. (2021). "The Awareness of the Circular Economy Principles in Moldova's Companies." Annals of Spiru Haret University. Economic Series, 21(4), 291–301, doi: <https://doi.org/10.26458/21416>
 18. TOMIĆ, V., & ANDJELIĆ, S. (2021). "The Production of Electricity from Renewable Energy Sources in the Republic of Srpska." Annals of Spiru Haret University. Economic Series, 21(4), 303–312, doi: <https://doi.org/10.26458/21417>
 19. ILIĆ, M., POPOVIĆ ŠEVIĆ, N., RANKOVIĆ, M., & BUCEA-MANEA-ȚONIȘ, R. (2021). "Competitiveness and Innovation: The Case Studies of Serbia and Romania." Annals of Spiru Haret University. Economic Series, 21(4), 313–326, doi: <https://doi.org/10.26458/21418>
 20. GÂRDAN, I.P., GÂRDAN, A.G., BAICU, C.G., & JIDOVEANU, D.C. (2021). "A Systematic View Regarding Business Rethinking in the Context of Supply Chains Sustainability." Annals of Spiru Haret University. Economic Series, 21(4), 377–397, doi: <https://doi.org/10.26458/21422>
 21. OZIOMA, O.A.H., & UKPERE, W.I. (2021). "Demand Forecasting as a Veritable Tool for Higher Managerial Efficiency in Industries in Nigeria." Annals of Spiru Haret University. Economic Series, 21(4), 417–438, doi: <https://doi.org/10.26458/21424>
 22. CRETOIU, R.I., UNGUREANU, A., UNGUREANU, A., & MIHALI, A.M. (2021). "New Types of Business Developed in the Pandemic." Annals of Spiru Haret University. Economic Series, 21(4), 455–465, doi: <https://doi.org/10.26458/21426>
 23. ŽIVKOVIĆ, S., ILIĆ KRSTIĆ, I., ILIĆ PETKOVIĆ, A., STOJILJKOVIĆ, M., & MILENOVIĆ, M. (2021). "Job Satisfaction of Nurses During Covid-19 Pandemic." Annals of Spiru Haret University. Economic Series, 21(4), 467–477, doi: <https://doi.org/10.26458/21427>
 24. ZORZOLIU, R., IATAGAN, M., & GURGU, E. (2021). "The Economic Crisis Caused by the COVID-19 Pandemic." Annals of Spiru Haret University. Economic Series, 21(4), 479–487, doi: <https://doi.org/10.26458/21428>
 25. ADEKANMBI, F.P., & UKPERE, W.I. (2021). "Perceived Organizational Culture, Co-worker Support, Work Performance, and Employee Demographics as Correlates of Organizational Commitment." Annals of Spiru Haret University. Economic Series, 21(4), 529–547, doi: <https://doi.org/10.26458/21431>
 26. FORE, C., & UKPERE, W.I. (2021). "Ameliorating Adverse Effects of Globalization on Employment Relations in Zimbabwe." Annals of Spiru Haret University. Economic Series, 21(4), 595–621, doi: <https://doi.org/10.26458/21435>
 27. Annals of Spiru Haret Economic Series [cited 2021 Dec 15]. Available from: <http://anale-economie.spiruharet.ro/>
 28. Annals of Spiru Haret Economic Series Link [cited 2021 Dec 15]. Available from: <http://anale.spiruharet.ro/index.php/economics/login>



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Talking about big data-driven smart urban economy at the 6th edition of icesba international conference on sciences and business administration

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Abstract: In this paper, we would like to make a brief presentation of the international academic event – the ICESBA 2021 conference, entitled Big Data-Driven Smart Urban Economy. The sixth ICESBA conference took place in Bucharest, on 26 and 27 November 2021. Due to COVID-19 pandemic situation, the transmission was live and online, with the support of Google Meet platform and live streaming on YouTube. The event was an important success, being among the few conferences of this magnitude in Europe. There was such a significant presence of an impressive number of co-partner universities and research institutes, as well as university professors as keynote speakers from universities all around the world. It was also marked by a significant presence of works and co-authors eager to share the results of their own work during two full days of presentations and lively debates.

Key terms: big data, smart management, artificial intelligence, acoustic information systems, Internet of Things System

1. Introduction

The ICESBA 2021 International Conference – Big Data-driven Smart Urban Economy, organised by the Bucharest Faculty of Economic Sciences, Spiru Haret University, was held online on November 26–27 2021, with the participation of numerous professors and researchers from the country and abroad. In recent years, the ICESBA International Conference developed continuously, but this year's conference has enjoyed unprecedented success, with a large number of participants and keynote speakers.

ICESBA 2021 Conference, the 6th International Conference on Economic Sciences and Business Administration, entitled BIG DATA-DRIVEN SMART URBAN ECONOMY was organised by Spiru Haret University from Bucharest, Romania, through the medium of the Central Research Institute, on the initiative of the Faculty of Economic Sciences in Bucharest. The international conference was co-hosted by two recognised professors of Spiru Haret University: associate prof. George Băză PhD, from the Faculty of Economic Sciences, Bucharest, Romania, member of The American Association for Economic Research, New York City, USA, and associate prof. Elena Gurgu, PhD, from the Faculty of Economic Sciences, Bucharest, Romania, Deputy Editor-in-Chief of the international indexed journal Annals of Spiru Haret University. Economic Series.

In the opening of the International Conference ICESBA 2021, speaking on behalf of the management of the Faculty of Economic Sciences Bucharest, professor Luminița Ionescu, PhD delivered welcome messages to the guests from abroad and thanks to the teachers involved in organising the event. Next, associate professor George Băză who enthusiastically welcomed all the participants, congratulated the co-organisers of the conference, universities from the United States and Europe, respectively, after which he explained how the conference works. Associate professor Elena Gurgu also addressed a few words of welcome to the Romanian and foreign participants, presenting some of the international guests from prestigious universities in Europe, Africa and Asia.

2. A short presentation of organisers

And now, allow us to tell you a few words about the organisers.

The Spiru Haret University is a private university in Bucharest, Romania, founded in 1991 by the president of Tomorrow's Romania Foundation, Aurelian Gh. Bondrea, as part of the teaching activities of this foundation. The university has been organised according to the model used by Harvard University, USA. The university bears the name of a scientist and reformer of the Romanian education, Spiru Haret, who lived before World War I. On 14 February 14 2000, the university was accredited by the National Council of Academic Evaluation and Accreditation of Higher Education Institutions. By 2009, it had 30 faculties with 49 specialisations and 64 master's degree curricula, being, according to the newspaper Financiarul, the largest university in Romania. In 2009, the enrolment was reported at 311,928 students. Regarding the number of its students, it is the second-largest private university in the world, after Islamic Azad University (with 1.3 million students). Pope John Paul II and former Romanian president Ion Iliescu have received honorary doctorates from the university. In 2016, the UK National Academic Recognition Information Centre listed Spiru Haret University as a recognised higher education institution.

The Central Research Institute of Spiru Haret University is the research structure at the University level, providing the scientific and methodological coordination of the University research centres. The Central Research Institute aims to:

- » consolidate the multidisciplinary academic research (inter- and intradisciplinary);
- » provide the conditions required by the University to participate in national and international research networks and programmes;
- » provide specific services to various beneficiaries;

- » help the University publications be cited, by their inclusion into international databases;
- » provide constant financing sources;
- » increase performance and scientific outcome of the teaching and research personnel at the University, at the national and international levels;
- » educate the undergraduate students and master and PhD candidates for best performance and scientific competitiveness;
- » engage real-word research problems through public/private partnerships.

2.1. Co-organisers of the ICESBA 2021 International event

The event was organised in partnership with reputable educational institutions and research institutes from all around the world, such as American Association for Economic Research from New York City, USA; Azerbaijan Tourism and Management University from Baku, Azerbaijan; Instituto TESEO from Salerno, Italy; National Institute of Economic Research from Chisinau, Republic of Moldova; Vasil Levski National Military University from Veliko Tarnovo, Republic of Bulgaria; Silesian University in Opava, Czech Republic; University Business Academy in Novi Sad, Republic of Serbia; Faculty of Contemporary Arts from Belgrade, Republic of Serbia; High School of Vocational Studies from Belgrade, Republic of Serbia; Information Technology ITS-Belgrade, Republic of Serbia; University of Johannesburg, South Africa; University of Zilina (UNIZA), Slovak Republic; USH ProBusiness from Bucharest, Romania; Vishwa Viswani Institute of Systems and Management from Hyderabad, India and Vishwa Viswani School of Business from Hyderabad, India.

But among the most influential co-partners are by far the institutions coming from Belgrade, Serbia, whom the organisers thanked for their trust, but also for supporting the ongoing international event to the best of their ability. The merits were awarded in a very special way to professor Milena Ilić, a fierce supporter of the research interests of the institutions of which she is a part as a teacher.

And now allow us to tell you a few words about the co-organisers.

The American Association for Economic Research from New York City, USA, carries out research on cognitive technology-driven automation; its president is Michael A. Peters, Emeritus Professor, University of Illinois. Top-ranking universities where the authors are located include Harvard University, University of Oxford, Yale University, Princeton University, Massachusetts Institute of Technology, University of Cambridge, Stanford University, and Boston University.

Azerbaijan Tourism and Management University (abbr. ATMU) trains people in tourism in Baku, Azerbaijan. The institution was established under the Ministry of Culture and Tourism of the Republic of Azerbaijan. The professional goals of the university include improvement of the tourism industry, training personnel to meet the needs for qualified personnel in the field of travel, leisure and hospitality. In 2014, the institute became the university of tourism and management (Azerbaijan Tourism and Management University). Azerbaijan Tourism and Management University cooperates with many local and international organisations. Within the framework of cooperation, several research and development projects and teacher/student exchanges have been implemented.

The Istituto Teseo Alta Formazione e Ricerca Foundation from Salerno, Italy was founded in February 2019, first as a scientific association with its headquarters in San Donato Val di Comino (Fr), Italy; in July 2020, it became a foundation with its headquarters in San Cipriano Picentino (Sa), where it currently has its operational and legal headquarters. The Foundation operates in the field of higher education and research, in particular in the field of language mediation studies and training, language studies, psychological sciences applied to neurolinguistics, and economic studies.

The National Institute for Economic Research from Chişinău, Republic of Moldova, is a public institution (think-tank) engaged in scientific economic research. Its main beneficiaries are Ministry of Economy, Ministry of Agriculture and Food Industry, Ministry of Labour and Social Protection, Academy of Sciences and others. Its main activities concern scientific research in economy, finance, statistics, demography, reforming of social sphere, and integration of the Republic of Moldova into world economic circuit. Former experience covers a wide variety of applied research on the evolution of economic and social processes in Moldova, ensuring a stable economic growth and high living standards. The Institute's most important research directions are: economic and financial models, mechanisms for sustainable growth; business and investment environment; agricultural policies and informational base for rural development in the context of food safety; improvement of statistical information system according to EU standards; demographic and social development policies.

The Vasil Levski National Military University from Veliko Tarnovo, Republic of Bulgaria conducts training for: cadets and students in three areas of higher education: Social, Economic and Legal Sciences, Technical Sciences, and Security and Defence, detailed in seven professional fields, fifteen civilian and one military specialty and twenty one military specialisations corresponding to the branches and special forces. Also, the University conducts training for PhD students in fifteen accredited scientific specialties, as well as contingents of the Bulgarian Army for participation in missions abroad.

The Silesian University in Opava, the Czech Republic, has a high research output according to the QS World University Rankings, and includes three faculties: philosophy and science, public policies, and mathematics. All of the faculties offer courses at undergraduate, postgraduate and doctorate levels.

The University Business Academy in Novi Sad (UBANS), Republic of Serbia is a higher scientific-educational institution, an autonomous and private university. Established in 2000, UBANS was the first privately owned university accredited in the Autonomous Province of Vojvodina, by both the national and international Quality Assurance Authority. The University holds the Certificate of State Accreditation of the Commission for Accreditation and Quality Assurance (CAQA) from the Ministry for Education, Science and Technological Development of the Republic of Serbia, which is a member of an INQAAHE (International Network for Quality Assurance Agencies in Higher Education) and has a candidate member status with ENQA (European Association for Quality Assurance in Higher Education).

Faculty of Contemporary Arts from Belgrade, Republic of Serbia is part of University Business Academy in Novi Sad, Serbia, an accredited faculty of performing and applied arts offering a wide range of essential skills for any 21st-century artist. It was founded in 1997 as the first private faculty of arts in those parts of Serbia. It has formed many successful and renowned artists, known not only in the region, but also in the world's preeminent art centres. The study programme was designed in accordance with modern trends in artistic practice that impose no limits between artistic media, ways of expression, and the artist's sensibility. The study programme includes Bachelor, Master and PhD studies.

Information technology School ITS – Belgrade from the Republic of Serbia is the first accredited private higher education

institution in the information technology sphere in Serbia. It offers exquisite conditions for studying, state-of-the-art equipment, expert personnel, practical implementation of acquired knowledge, the most sought-after professions of today, internationally recognised certificates, and work in the selected field during the studies themselves. The study programme includes Bachelor and Master vocational studies.

The University of Johannesburg (UJ) is a public university located in Johannesburg, South Africa. The University of Johannesburg came into existence on 1 January 2005 as the result of a merger between the Rand Afrikaans University (RAU), the Technikon Witwatersrand (TWR), and the Soweto and East Rand campuses of Vista University. The newly emerged institution is one of the largest comprehensive contact universities in South Africa among the 26 public universities that make up the higher education system. UJ has a student population of over 50,000, more than 3,000 of whom are international students from 80 countries. UJ is one of the top ranked Universities in South Africa, and it is also highly ranked in the QS World University Rankings and other global rankings.

The University of Zilina from Slovakia has a very high research output according to the QS World University Rankings. Over the last 57 years, more than 52,000 students have graduated from the university; 1662 of them have been awarded a PhD degree.

USH Pro Business from Bucharest, Romania is a specialised centre for activities dedicated to the entrepreneurial environment of "Spiru Haret" University, designed to support companies and provide solutions to support competitiveness. The centre offers specialised services and assistance for the entrepreneurial environment through projects and programmes developed based on a prior consultation with companies and associations from the business environment. The USH Pro Business Centre adds value to existing services on the market today, through understanding the needs of partners and connecting them with academia. Offering high quality services to the Romanian business environment, with a dynamic and innovative attitude, USH Pro Business welcomes complete services covering a wide range of activities, research and innovation oriented towards market solutions, professional and vocational training up to support services, to support the competitiveness of companies and clusters, organisation of business events, etc. USH Pro Business ensures a careful and detailed observation of changes and trends in the business environment, so that their partners benefit from well-documented professional assistance.

Vishwa Vishwani Institutions of Systems & Management, which includes Vishwa Vishwani School of Business, from Hyderabad, India, is the third largest Business School Group in South India, having more than two decades of strong contribution in management education and research. The Group has three institutions offering postgraduate and undergraduate programmes in business management and information technology.

The ICESBA 2021 Conference had three media partners, namely: Romania of Tomorrow Foundation Publishing House from Bucharest, Romania, USH Academic Weekly Newspaper – National Opinion Academic Newspaper from Bucharest, Romania, and USH Radio Station – Radio7, also from Bucharest, Romania.

The publication partner of the ICESBA 2021 International Conference was the international indexed journal named Annals of Spiru Haret University. Economic Series – ASHUES. The Annals of Spiru Haret University. Economic Series (ASHUES) is an international peer-reviewed journal, whose Editor-in-Chief is the rector of Spiru Haret University from Bucharest, Romania, Dr Aurelian A. Bondrea (<http://anale-economie.spiruharet.ro/editor.html>). The journal has been publishing high-quality academic articles in economics since the year 2000. The peer-review is very fast and highly rigorous, and authors are carried along adequately in all the publication processes. Annals of Spiru Haret University. Economic Series (ASHUES) is indexed in international databases and libraries, such as: RePEc, ERIHPLUS, SSRN, ROAD, BASE, INDEX COPERNICUS INTERNATIONAL, DOAJ, ECONBIZ, INFOBASE INDEX, CROSS REF DOI, OAJI, WORLDCAT, OPEN AIRE, RESEARCH BIB, CEEOL, J-GATE, JOURNAL TOCs, PKP, OPEN ARCHIVES, GOOGLE SCHOLAR, ILLINOIS LIBRARY, ELECTRONIC JOURNALS LIBRARY, EUROPUB, STANFORD UNIVERSITY LIBRARIES, CORNELL UNIVERSITY LIBRARY AND OPEN LIBRARY (<http://anale-economie.spiruharet.ro/indexing.html>).

2.2. A brief note about carrying out the conference proceedings for the two days

The international conference ICESBA 2021 was held online via Google Meet, with videostreaming live presentation, on 26 and 27 November 2021. A large number of scientific papers (56 papers) in the field of technical-technological and social-humanistic sciences were presented, with authors, professors, scientific researchers and young scientists from all over the world (14 countries), who presented their research papers through four conference panels, which were held through remote access with ICT, for compliance with epidemiological measures and recommendations:

- » "Smart Management in the Knowledge-Based Urban Economy" (Panel 1);
- » "Big Data-Driven Smart Marketing" (Panel 2);
- » "Algorithmic Data-Driven Accounting Information Systems" (Panel 3);
- » "Artificial Intelligence Data-Driven Internet of Things Systems" (Panel 4).

Within the presentation in plenary session of keynote speakers' papers, 25 prominent academic and scientific researchers took part. Within the second day of the conference, in which articles were exhibited through all four planned panels, a total of around 80 authors took part.

The plenary session of the conference, which was addressed only by keynote speakers, took place throughout all day of 26 November 2021, being a real scientific marathon that started at 9:00 AM, EET, with a short verification of the online platform operation, and ended with the closing ceremony speech of the hosts at 7:00 PM. At the plenary session, 25 guests from 14 countries took turns speaking, delivering approximately 10-minute speeches with 5-minute question and answer sessions. The debate of the scientific works was dynamic and pleasant, in a relaxed scientific atmosphere. The recording of the entire plenary session, as well as the panel registrations, can be seen by accessing the link – <http://icesba.eu/virtual.html>, which is attached on the conference website, icesba.eu. [1]

Now allow us to tell you a few words about the keynotes of ICESBA 2021 International Conference.

Melina Allegro is Vice-President, Director of International, External and Orientation Relations and member of the Board of Directors of the Fondazione Istituto Teseo Alta Formazione e Ricerca from Salerno, Italy. She acquired a diploma in Educational Sciences and obtained the 2nd level Executive Master "Governance, Management and Development of Human Resources in the Public Administration". She is also a permanent teacher at MIUR – Italian Ministry of Education, University and Research, Rome, Italy, qualified to teach human sciences in secondary school, trainer in the field of experimental pedagogy and training processes,

technology of education and learning. She is a former member of the commissioner of the ordinary primary school competition commission in 2016.

Nelli Amarfii-Railean has a PhD in Economics, and teaches as an associate professor at the Department of Economic Studies, Faculty of Real, Economic and Environmental Sciences, Alecu Russo Balti State University, Republic of Moldova.

Stefano Amodio is a doctor in philosophy, president, director of education and professor of psychology of work at Teseo University, in San Cipriano Piacentino, Italy.

Adam Balcerzak teaches at the University of Warmia and Mazury in Olsztyn, Poland. He has more than 500 citations in WoS and Scopus. He is the Editor-in-Chief of the journal *Oeconomia Copernicana*, Web of Science, IF 4.274, AIS 0.305. Quartile in Category Economics: Q1.

Dragan Ilić got his PhD degree at the Faculty of Economics and Engineering Management in 2011. His academic career started at Educons University in 2006. Since 2011, he has been working as a lecturer at the Faculty of Economics and Engineering Management. Until June 2013, he was the Marketing Director of the University Business Academy in Novi Sad, and in the period from 2013 to 2015, Dr Ilić was appointed as Vice-Dean for Science and International Cooperation at the Faculty of Economics and Engineering Management. Since 2015 he has been the Coordinator for International Cooperation at the University Business Academy in Novi Sad, Serbia. Prof. Ilić is a regular consultant and analyst of the Serbian national TV station The Radio Television of Serbia, and the Radio Television of Vojvodina in areas of agribusiness, entrepreneurship, national economy and international business. Since the academic year 2013/2014, he has been an associate member of several universities where he has delivered several guest lectures: Faculty of Logistics (Celje, Slovenia), Budapest Metropolitan University (Budapest, Hungary), Széchenyi István University, Kautz Gyula, Faculty of Economics (Gyor, Hungary), EPHEC University College (Brussels, Belgium), Sakarya University (Ankara, Turkey), and Stuttgart Media University (Stuttgart, Germany) in the fields of marketing, logistics, agribusiness, entrepreneurship, and management. He is also a member of the academic network Businet which gathers more than a hundred higher education institutions from all over the world. He has published over 40 scientific and research papers and has participated in over 50 international conferences and meetings.

Milena Ilić is a doctor of Economic Sciences, and teaches as an Assistant Professor at the Faculty of Contemporary Arts in Belgrade, and Information Technology School – ITS, Belgrade, Serbia. Milena is an author of ten textbooks and editor of three scientific monographs of international importance. In addition, she has published over 120 original scientific papers in international and national scientific journals, monographs and proceedings of international and national importance. She has conducted scientific research in the realms of Educational Technology, HRM, Economics, Circular Economy, Entrepreneurship and more.

Victoria Iordachi has a PhD in economics and is a coordinator researcher at the Department of Financial and Monetary research of the National Institute for Economic Research (NIER) of the Ministry of Education and Research of Moldova, from Chişinău. The domains of her scientific interest include: circular economy, cluster associations, illegal financial flows, international financial flows, financial markets. She is a member of the teams of several research projects, a national expert for the evaluation of educational programmes, and a member of scientific committees at international scientific conferences.

Baktybek Isakov teaches at Kyrgyz-Turkish MANAS University in Bishkek, Kyrgyzstan. He is the author of several monographs and many articles in peer-reviewed journals. He took part in a variety of international projects and is a co-founder of Online University in Bishkek, Kyrgyzstan.

Tomas Klietk is full professor and the head of the Department of Economics of the Faculty of Operation and Economics of Transport and Communications, University of Zilina. He has more than 1,500 citations in WoS and Scopus. He is the coordinator of an international conference with a good history in WoS.

Maria Kovacova teaches at the Faculty of Operation and Economics of Transport and Communications, University of Zilina. She has more than 700 citations in WoS and Scopus. She is the associate coordinator of an international conference with a good history in WoS.

Valentin Kuleto is the founder and president of the leading multinational company LINKgroup, which has been successfully engaged in education management and professional education and certification in the field of information technology and modern business for 25 years, through as many as 15 educational institutions and over 50 educational services. He is an associate professor at the Faculty of Contemporary Arts in Belgrade and at the Information Technology School – ITS, Belgrade, Serbia. Dr Kuleto is the author of five books and many scientific and professional papers published in journals, national and international conferences proceedings, and scientific monographs of international importance on Modern Education, Educational Technology and Information Technology.

Costin Lianu, PhD is an associate professor at the Faculty of Economic Sciences from Bucharest, Vice-rector at Spiru Haret University, and General Director of USH ProBusiness Center, Bucharest, Romania.

Daniel Meyer is a professor at the College of Business and Economics and Director of the School of Public Management, Governance and Public Policy at the University of Johannesburg, South Africa. Daniel is a specialist in regional and local economic development analysis and policy development. He has developed various innovative measurement tools, indexes and scales to analyse regional economies. He has authored more than 100 internationally peer-reviewed research papers since 2015 and presented over 60 international conference papers, including a number of keynote addresses. His research is multidisciplinary through the combination of development economics, business, public management and governance. He has established a large international network of research partners across the globe with a strong focus on the Visegrad group of countries. He has also successfully completed and delivered more than 40 regional development strategies for local governments and provincial governments. He is also involved in various community development projects in the communities where he lives. During his academic career he has received a number of awards, which include: most inspiring lecturer in 2012; Vice-Chancellor's award for community engagement via the Vaal LED warrior initiative in 2016; media person of the year in 2016; and most productive senior researcher on the NWU, Vaal campus in 2016, 2017 and 2018; most productive senior researcher in the NWU Faculty of Economic and Management Sciences in 2019; and runner-up most productive senior researcher in 2020 at NWU. His motto in life is "give more than you take".

Natanya Meyer is an associate professor at the Department of Business Management of the College of Business and Economics, University of Johannesburg, Gauteng, South Africa. She is part of the DHET-NRF SARCHI Entrepreneurship Education Chair. Her research focusses on entrepreneurial and economic-related topics. She is an editor, editorial board and scientific

committee member, as well as a reviewer for several national and international journals.

Edwin Mirfazli is a researcher at Academics Computer Laboratorium Economics and Business Faculty University of Lampung. He has more than 100 citations in WoS and Scopus and has experience in Business, Social Accounting, CSR and Sustainability Research. Also, he has published articles at Emerald Scopus Journal. He is the deputy director for foreign affairs and corporation at Graduate School University of Bandar Lampung, Indonesia, and Visiting Professor for Keynote Speaker at International Workshop University of Bologna, Rimini Campus, Italy.

Rodica Perciun is a PhD habilitate, professor and the head of the Department of Financial and Monetary research, National Institute for Economic Research (NIER) of the Ministry of Education and Research of Moldova, from Chişinău. She is the director of many national institutional projects, member of some editorial boards, national and international expert for independent project evaluation, and member of many scientific committees in international scientific conferences.

Elitsa Petrova is an associate professor in the field of Social, Economic and Legal Sciences, Doctor in Economics and Management and Doctor of Science in Security and Defense at the Vasil Levsky National Military University from Veliko Tarnovo, Bulgaria. She is one of the Erasmus Coordinators and LEAR for Horizon for the university. She conducted lectures at many foreign universities and academies in Romania, Slovakia, Czech Republic, Poland and Hungary.

Viorica Popa has a PhD in economics; she is a coordinator researcher at the Department of Financial and Monetary research, National Institute for Economic Research (NIER) of the Ministry of Education and Research of Moldova, from Chişinău. The domains of her scientific interest are: banking and non-banking sector, implementation of strategic management within organisations, insurance and public finance, circular economy, analysis of hazardous waste in the Republic of Moldova. She has been a member of the teams of several research projects, participating in various national and international conferences in the country and abroad, with presentations in her field of expertise. She is a member of an international conference with a good history in WoS.

Sabyasachi Rath is a professor and dean of Vishwa Vishwani Group of Institutions, Hyderabad, India. He has over 50 publications in national and international Journals including SCOPUS and other referred journals. He has presented 100 research papers in various conferences and co-authored and edited conference journals, books and white papers. He is also the Chief Editor of the journal called Marketing Guru Business Media.

Roman Šperka teaches at the Silesian University in Opava, the Czech Republic. He has more than 150 citations in WoS and Scopus. He is the coordinator of an international conference with a good history in WoS.

Marta-Christina Suci is a professor at the Bucharest University of Economic Studies, PhD supervisor and member of the Doctoral School of Economics 1, Faculty of Theoretical and Applied Economics, Department of Economics and Economic Policy. She is also an Associate Member of the Interdisciplinary Research Group of the Romanian Academy, as well as a Corresponding Member of the Romanian Academy of Scientists, Committee 9.

Wilfred Isioma Ukpere is currently a professor at the Department of Industrial Psychology and People Management at the University of Johannesburg (UJ). He contributes with a strong theoretical approach in his research with most of his output centred on critiquing the impact of capitalism in the post-cold-war era, notably in the context of emerging economies. His referees consider him to be an established researcher in the field of people management and development, notably within the domain of globalisation and its impact on human resources management. He has authored three books, two book chapters, 37 conference presentations/proceedings and about 230 journal articles in ISI/WoS/CA (Thomson Reuters), IBSS (Proquest), Scopus (SCImago), and SA DoHET (South African Department of Higher Education and Training) accredited Journals. He was the first National Research Foundation (NRF) rated researcher at the Faculty of Business at Cape Peninsula University of Technology (CPUT), and has received numerous research-related awards in recognition of his research contributions from CPUT, UJ, the NRF and Iona College in the USA. His Google Scholar citation is 2,369, while his Google Scholar H-index is: 25. He recently received a life Achievement Award from Macquis Who's Who in the World based in the USA in recognition of contributions to his field.

Katarina Valaskova teaches at the Faculty of Operation and Economics of Transport and Communications, University of Zilina. She has more than 1,000 citations in WoS and Scopus. She is the associate coordinator of an international conference with a good history in WoS.

Agil Valiyev is a lecturer at Azerbaijan Tourism and Management University. He is also a lecturer at different European universities from Sweden, Finland, Norway, Denmark, Austria, etc. He has more than 80 publications in different international journals. He is a member of an expert group in the Science and Technological Commission of UNCTAD – United Nations Conference on Trade and Development.

And these were all the keynote speakers from ICESBA 2021 Conference, who presented their papers at the conference and made significant contributions throughout the day of presentations and heated debates on interesting and current topics.

Assoc Costin Lianu, vice-rector of Spiru Haret University, read the message of the organising institution's management, greeted all participants, and then, in the plenary of the Conference, supported the paper: The Role of Digital Innovation Hubs in Digital Transformation of Europe, Focusing on AI.

Professor Valentin Kuleto, from ITS Information Technology School, Belgrade, Serbia, presented a paper on Implementation of Extended Reality in Higher Education, Examining Students' Awareness.

Professor Maria Kovacova, from the University of Zilina, Slovak Republic, presented the paper Smart Factory Performance, Cognitive Automation, and Industrial Big Data Analytics in Sustainable Manufacturing Internet of Things.

Another keynote speaker, professor. Roman Sperka, from Silesian University in Opava, Czech Republic, spoke on Getting More from Real Business Data, which was of great interest to all conference participants.

Other keynote speakers were: Dragan Ilic, from University Business Academy in Novi Sad, Serbia, with How to Use Smart Data to Deliver Higher Marketing ROI?, Milena Ilić, from University Business Academy in Novi Sad, Faculty of Contemporary Arts Belgrade, Republic of Serbia, who presented the paper entitled: Competitiveness and Innovation: The Case Studies of Serbia and Romania, and from Azerbaijan Tourism and Management University, Baku, Azerbaijan, associate professor PhD Agil Valiyev who talked about AI on the Advanced Entrepreneurship in Small Business: Three Countries as Case Studies.

Viorica Popa, from the National Institute for Economic Research, Republic of Moldova, presented the topic Hazardous Waste Management through Smart Digitization, Victoria Iordachi, from the National Institute for Economic Research, Republic of Moldova, presented the topic Smart City Development by Sustainable Digital Transformation, and Tomas Klietk, from the University of Zilina, Slovak Republic, presented the paper on Distinctive Determinants of Financial Indebtedness: Evidence from Slovak and Czech Enterprises.

Of particular interest was Professor Sabyasachi Rath, Dean of the Viswa Viswani Institute of Systems and Management, Hyderabad, India, who presented his paper entitled Dawn of Marketing 5.0: The Symbiosis of Agile, Augmented and Predictive Marketing.

The second part of the first day of the conference was reserved for the following speakers: Professor Stefano Amodio, from the Teseo Institute, Salerno, Italy – Organizational Expertise and Decision Making in Corporate and Complex Organizations, Melina Allegro, from the Italian Ministry of Education, University and Research, Rome, Italy – Conflict in Working Relationships: An Overview. The Crisis of Roles in Modernity: The Man–Woman Working Relationship, Katarina Valaskova from the University of Zilina, Slovak Republic – with her paper entitled Quo Vadis, Earnings Management? Analysis of Manipulation Determinants in Central European Environment, and Edwin Mirfazli, University of Lampung, Indonesia – presenting his paper named Corporate Social Responsibility (CSR) Disclosure Perform in Accounting Perspective.

Towards the end of the first day of the conference, interesting papers were presented by Daniel Meyer, from the University of Johannesburg, Gauteng, South Africa – An Assessment of the Interrelationships between Country Risk, Economic Growth and Good Governance: The Case of the Visegrád Four, Elitsa Petrova, from Vasil Levski National Military University, Veliko Tarnovo, Republic of Bulgaria – An Empirical Study in a Real Environment on the Problem of Students' and Cadets' Performance in the Educational Process, and Baktybek Isakov, from Kyrgyz – Turkish Manas University, Bishkek, Kyrgyz Republic – Structuring the Idea through Data, Hypothesis and Title Triangles.

The first day of the conference ended with a series of conclusions, final comments, remarks and congratulations from the organisers and chairs of the ICESBA 2021 International Conference.

On the second day, Nov. 27. 2021, the panel conference took place, being moderated by four distinguished USH professors, as follows:

- » PANEL 1, called Smart Management in the Knowledge-based Urban Economy – Chair: Professor Daniela Pașnicu, PhD, Spiru Haret University, Faculty of Economic Sciences, Bucharest, Romania and also senior researcher at National Scientific Research Institute for Labor and Social Protection, Bucharest, Romania;
- » PANEL 2, called Big Data–driven Smart Marketing – Chair: Professor Luminița Ionescu, PhD, Spiru Haret University, Director of Economic Sciences Department, Faculty of Economic Sciences, Bucharest, Romania
- » PANEL 3, called Data–driven Accounting Information Systems – Chair: Associate Prof. Elena Gurgu, PhD, Spiru Haret University, Faculty of Economic Sciences, Bucharest, Romania and Deputy Chief-Editor of the Journal The Annals of Spiru Haret University. Economic Series
- » PANEL 4, called Artificial Intelligence Data–driven Internet of Things Systems – Chair: Associate Prof. Mihai Andronie, PhD, Spiru Haret University, Faculty of Economic Sciences, Bucharest, Romania

At the panel sessions, around 84 guests from 14 countries took turns speaking, delivering approximately 10-minute speeches with 5-minute question and answer sessions. The debate of the scientific works was dynamic and pleasant, in a relaxed scientific atmosphere. The recording of the entire panel sessions from 26 and 27 November 2021 can be seen by accessing the link <http://icesba.eu/virtual.html>, which is also attached on the conference website, icesba.eu.

3. Relevant aspects from the abstracts of some presented papers at the ICESBA 2021 Conference

In the following paragraph, allow us to present to you only a few important aspects from some of the papers that were presented at the ICESBA 2021 International Conference.

In his scientific paper named THE RELIABILITY OF DATA-DRIVEN INTERNET OF THINGS SYSTEMS, Slavko POKORNI said that the goal of this paper is to show that reliability in the data-driven Internet of Things (IoT) must be taken into account. The reliability of data-driven IoT is a complex problem because such a system comprises hardware, software, human and data. The reliability of each of these elements is briefly analysed, and the equation for the reliability calculation of a data-driven IoT system is proposed. Artificial intelligence is also included. Reliability is connected with availability and maintainability, and this is also explained. This paper is written mainly using two references recently published by the author of this paper [2] [3].

In their paper, the authors Maria ANDRONIE, Luminita IONESCU and Irina DIJMARESCU discuss How Chatbots Will Impact Public Sector and Accounting. The digital transformation of accounting will affect the daily activity of companies and will profoundly impact the employment landscape. The scope of this research is to present the components of the high-level architecture for public service chatbots and the usage of chatbots in the public sector. The last part of the research analyses how chatbots will impact accounting and what effect the digitisation of work will have on jobs. Artificial intelligence is expanding and there are many benefits of using chatbots in the public sector for user interface, dialog management, interaction recording, and filtering and feedback from the customers. In the last decade, there has been a significant rise in interest for artificial intelligence, non-humanoid robots, chatbots, and encryption. Chatbot technology could speed up communication between advisers and clients/citizens, and more recently between accountancy and public authorities. Several European countries have implemented chatbots for providing public services in order to respond to the increasing demand of information from citizens towards public administration. The European Union encourages the use of open data portals for taxes and reporting purposes, but also for improving the quality of public services while increasing public sector efficiency. The chatbot network could improve the European public system in the near future and boost economic growth [4].

Rodica PERCIUN and Nelli AMARFII-RAILEAN made a research on INDUSTRY 4.0 VERSUS TRADITIONAL ECONOMY IN REPUBLIC OF MOLDOVA. They made an interesting case study about the signs of progress in the digitalisation of economic processes over the past decades that have led to the definition of the fourth industrial revolution called "Industry 4.0". In a context where countries of the world either implement the tools of Industry 4.0 in business or set out Industry 4.0 as a development strategy, the authors were concerned about the extent to which Republic Moldova economy is ready to implement new digital tools and informational challenges. The research aims to highlight the environment necessary for capitalising on the innovations of Industry 4.0 to ensure sustainable development. The article examines international experience in the field of economy digitalisation versus the Republic of Moldova's experience, contains the analysis of the legal framework, the diagnosis of the economic indicators regarding the ICT implementation in the Moldovan economy, and international good practices in the field of Industry 4.0. The research was conducted within the State Program 20.80009.0807.22 Developing the circular economy mechanism for the Republic of Moldova [5].

Sonja VUJOVIĆ, Tamara RAĐENović and Tanja VUJOVIĆ wrote a very interesting paper about THE APPLICATION OF AUGMENTED REALITY IN PROMOTING HOTELS AND TOURIST ATTRACTIONS OF THE CITY OF NIŠ. In the era of digital transformation, especially during the coronavirus pandemic, there have been changes in the way the tourist offer is presented to potential customers. This has been especially facilitated by information technologies that enable bringing the tourist destinations and hotel facilities closer to consumers. The study aims to identify the opportunities and challenges offered by augmented reality in terms of creating personalised consumer experiences, tourism development, and greater visibility of the hotel and its facilities in the global market. The intention of the authors was to fill in the gaps in knowledge and raise the awareness of the value of augmented reality for tourism. Based on the research conducted in the City of Niš, it was concluded that the current application of augmented reality in the promotion of hotels and tourist attractions in the city is insufficient and recommendations were given on how to use the benefits of augmented reality in tourism promotion [6].

Elena GURGU, Raluca-Ileana ZORZOLIU, Luminita PISTOL, Ioana-Andreea GURGU, Camelia UNGUREANU and Gica NAE in their paper entitled THE RELATIONSHIP BETWEEN BIG DATA-DRIVEN TECHNOLOGIES AND PERFORMANCE MANAGEMENT STRATEGIES APPLIED TO COMPANIES IN THE HOSPITALITY, TOURISM & TRAVEL INDUSTRY discussed big data-driven technologies that the tourism industry has adopted along the way, especially in recent years, as well as the top trends based on artificial intelligence expected to radically transform travel in the future. The big data-driven technologies of the future in the tourism industry, which are essentially based on artificial intelligence – AI, augmented reality – AR, Machine Learning – ML, virtual reality – VR, and the Internet of Things – IoT are those that have dictated new trends in efficient management strategies at the level of companies operating on the tourist market. The authors tried to bring arguments, with figures and statistical data taken from international statistics, but also appealed to the opinions of several authors from around the world who wrote in the last years in their articles published in prestigious international journals on the impact of new information technologies on increasing the turnover in tourism, increasing the sales of tourist packages, diversifying the tourist offer to customers or easier ways to find the perfect destination, to make a reservation easier or to pay for a tourist service in much more advantageous and faster conditions. All this represents the role of companies' efforts and their strategic management, which is more efficient and adapted to the requirements of the constantly moving and evolving market, a tourist market that has largely moved to the online environment and is increasingly helped by software and robotisation transformations, such as virtual assistants, computer programs for image analysis, search engines, imaging recognition systems, robots, autonomous cars, drones or IoT. However, it can be seen that despite the promise made by AI, many travel companies do not yet realize the full potential offered by big data-driven technologies [7].

Svetlana NOVAKOVIĆ CAREVIĆ, Jasmina BAŠIĆ and Irina DIJMARESCU wrote an interesting research about AI-ASSISTED DIAGNOSTICS IN HEALTH MANAGEMENT. Healthcare is characterised by great pressure in a context where there is no room for experimentation or mistakes, given the fatal consequences and unpredictable outcomes. This paper aims to present the specifics of health management and usage of artificial intelligence to improve work performance, job satisfaction, and, most importantly, patients' health. This is achieved through the introduction of an artificial intelligence system in healthcare facilities [8].

Miljan PELEŠ, Svetlana JEVREMOVIĆ, Aleksandar SIMOVIĆ and Aleksandra HADŽIĆ made an interesting research about THE POSSIBILITIES FOR DEVELOPING AND IMPLEMENTING A MOBILE APPLICATION FOR RECOGNIZING THE SHAPE OF THE ENVIRONMENT, TEXT, AND READING QR CODES USING THE ANDROID CAMERAX FRAMEWORK AND THE MACHINE LEARNING KIT. The advancement and development of digital technologies have resulted in the need to network various devices at the application level. Wireless communication between devices via the Internet has opened a plethora of possibilities for enhancing user capabilities. We are witnessing dizzying changes in computer technology, and we can conclude that the device's purpose is no longer narrowly defined. The mobile phone is evolving into a personal computer, innovative features are being added to today's televisions, and cameras can process and send photos. These are merely a few examples of universal electronic devices. Of course, for the device to perform all these functions, adequate hardware infrastructure integrated into the device itself is required, as is the fundamental software component that connects user operations and the components themselves – the operating system. This paper's operating system under consideration is the Android operating system, which is currently the most popular operating system for smart devices [9].

Milica JEVREMOVIĆ, Hana STEFANOVIĆ, Dušan STOJAKOVIĆ and Nada STALETIĆ presented an interesting paper entitled: CAN WE PREDICT THE EFFECTS OF USING THE INTERACTIVE FEATURES OF THE WEBSITE? This paper aims to determine the effects expected on users after introducing interactive features into a website. For this purpose, three models by Song, Liu and Wu were compared, which gives this paper an extraordinary precision and depth of research on the given problem. The paper's contributions are reflected in a comprehensive, detailed review of previous research on interactivity, the importance of using the website and showing the specific effects expected from users after introducing interactive website features. Furthermore, the paper's contribution is reflected in recognizing the importance of site interactivity in job search/training courses/internships. Finally, users who used the interactive site compared to non-interactive sites had a significant increase in activity [10].

Roxana-Daniela PAUN, in her paper entitled OVERVIEW OF SOME LEGAL ASPECTS OF TECHNOLOGIES BASED ON ARTIFICIAL INTELLIGENCE, discusses artificial intelligence as a challenge of the new decades, more current than ever, that can help man or replace him. The decision belongs to those who decide, through their research, how much independence new human-created technologies create. Beyond the strictly scientific aspects that invented and developed artificial intelligence (AI), this consideration includes aspects of ethics, morality, and, last but not least, the legal aspect. There are already debates on this topic online, where opinions are divided between conservative issues and innovation at any cost. The fear of the new can persist, although man is already accustomed to assistance (Shazam, Waze, personal assistants). If AI is already replacing the musician who performs, for example, Beethoven's symphonies, how far can this technology evolve and what would be the limits to which man cannot replace it? The present study proposes a brief analysis of some legal aspects that must be considered with the large-scale application of AI-based technologies, from the perspective of respect for human rights and fundamental freedoms, on the one hand, but also the responsibility in AI. (Who is responsible and what would be the limits of liability for AI.) [11].

Valentin KULETO, Milena ILIĆ, Aleksandra HADŽIĆ and Katarina RAKETIĆ, in their paper entitled THE IMPLEMENTATION OF EXTENDED REALITY IN HIGHER EDUCATION, EXAMINING STUDENTS' AWARENESS describe the documents and confirm the benefits of applying extended reality (XR) into higher education. Challenges that occur in the comprehensive reality (XR)

domain (such as virtual reality (VR), augmented reality (AR), and mixed reality (MR)), as well as their causes and solutions, are further discussed. The chapters include perspectives from technology, design, human factors, and various technologies and ideas. XR is primarily or exclusively focused on the display, as it does not include other modalities such as audio, haptic, smell, or touch. Therefore, the primary focus was placed on the benefits of using XR, though other disciplines that may intersect with higher education were considered where appropriate. As a whole, the study aspires to provide a comprehensive overview of challenges, opportunities, and future trends of XR that will be applied in educational institutions. Primary research in the form of survey research (exploratory research) that included 83 subjects showed a high awareness of XR among students of the chosen HEI and usage of this technology in students' daily lives, and that whether they use XR depended on the age of the survey respondents. To determine whether there was a correlation between the use of augmented reality and the age of the survey respondents, non-parametric statistics based on the ranks of observations – Spearman's correlation coefficient – were used. IBM SPSS statistical data processing and analysis software was used to calculate Spearman's correlation coefficient. Based on the sample observations and the inference statistics used, it cannot be asserted that there is a direct correlation between the use of augmented reality in everyday life and the age of the survey respondents. However, the results showed that a high percentage of respondents were aware of XR (78.31%) but the responses on whether they use this technology in their daily lives were almost evenly distributed: 34.94% of survey respondents reported that they used it in their daily lives, 33.73% that they did not, while 31.33% opted for Maybe (not aware of the same) [12].

Marija Nikolic TOSOVIC and Violeta JOVANOVIĆ, in their paper entitled THE ANALYSIS OF ENTREPRENEURIAL INTENTION OF MANAGEMENT STUDENTS IN THE TIMOK REGION – OVERVIEW OF ATTITUDES AND OPINIONS are talking about the sector of small and medium enterprises and entrepreneurs (SMEs) could play a key role in further national economic growth of Serbia through employment, increasing competitiveness and exports, but also in solving the problem of unequal regional development. One of the most economically and demographically underdeveloped regions in Serbia is the Timok region. This region is also characterised by reduced investment activities in the SME sector. Increasing the attractiveness of the region for new entrepreneurs and investors and increasing the competitiveness of local entrepreneurs will create new, attractive and stable jobs which will further help to retain qualified people in the region. This paper gives a voice to future bearers of economic activity in this specific region, and represents the first research on entrepreneurial attitudes, opinions and intentions of young people in this part of Serbia; 199 students of the final years of Bachelor and Master Studies of management in the Timok region participated in the analysis of entrepreneurial intentions. The obtained research results indicate that students have an entrepreneurial intention and that people from their immediate environment have a mostly positive attitude towards entrepreneurship. Respondents believe that they possess necessary theoretical knowledge and skills, but not practical ones. The results of the research point to the necessity of shifting the focus of education from a strictly academic to a practical level, to the connection of educational institutions with the economy, to the better connection among entrepreneurs themselves, and to an urgent need for the activation of entrepreneurs' associations [13].

Strahinja ĐORĐEVIĆ, Svetlana JEVREMOVIĆ, Jovana TOŠIĆ and Nina STOJANOVIĆ in their paper entitled SMART HOUSE WEB APPLICATION: DESIGN AND IMPLEMENTATION USING JAVA EE, MVC FRAMEWORK AND ARDUINO MICROCONTROLLER discuss the automation of the environment as an outcome of hectic modern life, which resulted in applications that would simplify and facilitate everyday life. This paper aimed to explore the possibilities of designing and implementing the web application "Smart House", which would make it easier for all users, especially those with limited or disabled mobility, to control the devices in the house. In the initial part of the paper, dedicated to the technologies used to develop the web application "Smart House", is theoretically processed. The research is illustrated with diagrams and tables. Documentation on application design and implementation is processed by Larman's method. At the same time, theoretical analysis of used technologies refers to the literature of authorities in the field of research of advanced concepts of Java, Java EE platform and Arduino microcontroller open-source development system, which allow modularity and ease of modification. The research examines cases of using the application when the actor is a user, and on the other hand, cases of using the application when the actor is an admin. Further, the system operations that need to be designed are observed. This is followed by the application implementation process, in which testing is performed simultaneously, which is the last and final phase of software system development to facilitate troubleshooting [14].

Victoria IORDACHI, in her paper entitled SMART CITY DEVELOPMENT BY SUSTAINABLE DIGITAL TRANSFORMATION, discusses the smart city concept, which has been gaining interest among municipalities, representing one of the solutions for various city problems, starting from urbanisation problems and ending with environmental challenges. In these conditions, approaches to urban development management are gradually revised and are increasingly reliant on advanced technological solutions, digitalisation and platformisation. Today, the digital upgrade of cities is becoming a central political choice for many countries, because it achieves, on the one hand, savings and efficiency in the operation of its services and in the management of its problems, and on the other hand, speed and transparency in decision making. This paper aims to analyse the role of smart technologies in promoting sustainability and smart city concepts, as well as to establish a relationship between these two concepts. The authors applied methods of scientific investigation like analysis and synthesis of specific literature in the domain of circular economy, smart city, smart technologies, induction and deduction, critical analysis of materials. Sustainable development is based on the interaction of three aspects that are interdependent and mutually reinforcing. These are the economic, social and environmental aspects of development. Thus, the circular economy concept can provide new, more impactful solutions to the smart city systems through new mobility, improving energy efficiency, smart environmental solutions [15].

Viorica POPA and Mihail CIOBANU, in their paper called USING SMART DIGITIZATION IN HAZARDOUS WASTE MANAGEMENT, talk about the rapidly growing global information society. At the same time, the increase in purchasing power, urbanisation and industrialisation in many developing countries have led to an increase in the quantities of products placed on the market and respectively purchased, thus generating large volumes of toxic waste. Thus, digitisation and connectivity are critical to help achieve the Sustainable Development Goals; the transition to an increasingly digitalised world also involves multiple risks due to irrational consumption of resources and mismanagement of waste. In our view, the problem of hazardous waste management is possible to solve by implementing modern and smart digital technologies in waste management, and implementing waste digitisation to improve the health of planet Earth will reduce the negative impact of pollutant emissions on the environment, and restore essential ecosystems to ensure our long-term sustainability. Thus, the use of waste as a resource is necessary in order to reduce the need to

extract new resources. This study was developed within the State Program 20.80009.0807.22 Development of the mechanism for the formation of the circular economy in the Republic of Moldova [16].

Olga TIMOFEI, in her paper entitled THE AWARENESS OF THE CIRCULAR ECONOMY PRINCIPLES IN MOLDOVA'S COMPANIES, discusses circular economy as a new approach to the responsible and cyclical use of natural resources, where the economy should aim at minimising the impact on the environment and stimulating the economy. Solving environmental issues in tandem with promoting sustainable growth has never been more current than it is today. One of the essential stages of the transition to a circular economy is the improvement of waste management, which is primarily due to limited global natural resources and the need to reduce their consumption. The Republic of Moldova, similarly to other countries in the world, annually produces huge amounts of waste, a significant share of which comes from companies and enterprises. In order to hold economic agents accountable in recent years, certain steps have been taken by public authorities, but they have remained without visible impact on the situation in the field. Because the adaptation of such a circular economy model is done at different levels, including at the level of individual, whether owner or employee of a company, the authors decided to conduct their survey in order to determine awareness of the principles of the circular economy of those who are involved in the real sector of the country's economy. The results of the interview clearly showed that the greatest efforts in the field of raising awareness and empowering companies are yet to be undertaken, and the transition to a circular economy in the Republic of Moldova will take some time [17].

Velinka TOMIC and Svetlana ANDJELIC, in their paper entitled THE PRODUCTION OF ELECTRICITY FROM RENEWABLE ENERGY SOURCES IN THE REPUBLIC OF SRPSKA, point out that reducing greenhouse gas emissions by at least 55% by 2030 requires higher shares of renewable energy and greater energy efficiency in an integrated energy system. The RS produces electricity from different sources. The Thermal power plant "Ugljevik", a relatively small plant, emits unimaginable amounts of dangerous sulphur dioxide. Bearing in mind the share of energy from fossil fuels, the question for the RS is how to provide enough energy to future generations. The development of the RES production in the RS is a crucial challenge for policymakers nowadays. This transformation will improve our health and well-being, create jobs, generate investment and innovation, reduce energy poverty and dependency on energy imports and strengthen the security of supply [18].

Milena ILIĆ P, Nevenka POPOVIĆ SEVIĆ, Marko RANKOVIĆ and Rocsana BUCEA-MANEA-TONIS, in their paper entitled COMPETITIVENESS AND INNOVATION. CASE STUDIES FOR SERBIA AND ROMANIA discuss non-technological innovation that comes from sectors with the capacity of applying knowledge provided by foreign companies and trade partners. Green procurement proved to be an essential factor that stimulates innovation and economic resilience. Social responsibility, a high level of competencies, and agile operational management are often found in companies in South-Eastern Europe. Romania made critical green procurement and agile management steps to impact productivity with a low footprint on the environment positively. On the other hand, Serbia could not access FP7 funds to invest in R&D and eco-innovation, reflected in a low Global Innovation Index Ranking. The paper addresses competitiveness and innovation within the case study model of Serbia and Romania, explores similarities and differences, and makes recommendations. Competitiveness and innovation are observed within the context of circular economy [19].

Iuliana Petronela GÂRDAN, Daniel Adrian GÂRDAN, Claudia Gabriela BAICU and Daniel Constantin JIROVEANU, in their paper entitled A SYSTEMATIC VIEW REGARDING BUSINESS RETHINKING IN THE CONTEXT OF SUPPLY CHAINS SUSTAINABILITY, analyse the crisis generated by the pandemic that has challenged the hospitality industry on multiple levels. This does not refer only to the reduced number of customers and the instability of the tourists flows, a part of the total lockdown from the beginning of the pandemic, but also to the managerial and marketing capabilities of hospitality companies to deal with profound changes along their supply chains. The present paper proposes a systematic review that aims to highlight the main directions in which the scientific literature from the field is analysing the complex issue of hospitality supply chain sustainability implementation. Authors selected only articles from journals, conferences or books indexed in the last five years within Web of Science databases. The results of the analysis show that implementation of sustainability related principles along the supply chains, combined with a proper sustainable human resources management and a special view upon the customer relationship management, offers to the hospitality field companies a certain sum of strategic instruments in order to cope with the huge challenge imposed by the pandemic. The future business models adapted entirely to a post-pandemic economy should emphasise a sustainable type of consumer behaviour and a supply-delivery chain based on intelligent "out of the box" collaboration between organisations along the chain [20].

Happiness Ozioma OBI-ANIKE and Wilfred Isioma UKPERE, in their paper called DEMAND FORECASTING AS A VERITABLE TOOL FOR HIGHER MANAGERIAL EFFICIENCY IN INDUSTRIES IN NIGERIA aimed at exploring the benefits of demand forecasting and portrayed it as a veritable tool for increasing managerial efficiency in industries in Nigeria. The study is an effort to show that the utilisation of demand forecasting could become a veritable way of minimizing wastages, thereby maximizing profits, recovering and reviving of Nigeria's ailing and moribund industries. In specific terms, limestone production and sales in Nigeria was used for a practical illustration. In doing this, the least squares approach and t-test statistics were used to analyse limestone production and sales in Nigeria from 2001 through 2010. Projections were made for limestone production and sales from 2011 through 2014. The year 2011 was used as a base year to compare projections with actual realisations for limestone production and sales data. It was found that there was no significant difference between the projected and real values for the limestone production and sales in the base year, thus re-affirming the efficacy of demand forecasting. It was therefore recommended, among other things, that managers rely strongly on demand forecasting throughout their operations [21].

Raluca Ionela CRETOIU, Anca UNGUREANU, Adrian UNGUREANU, Ana Maria MIHALI and Silvia RASCU PISTOL, in their paper entitled NEW TYPES OF BUSINESS DEVELOPED IN THE PANDEMIC, note that the impact that COVID-19 had, especially on business, which could not be anticipated, was a real challenge for entrepreneurs, from which they had to learn, and were determined to develop their creativity, coming up with solutions. and proposals for survival. The pandemic opened up a number of opportunities for business owners to meet the ever-changing needs and demands of consumers. Opportunities are identified and exploited only by those entrepreneurs who think ahead, who eventually become successful entrepreneurs later. According to the United States Census Bureau, more than 4.4 million new businesses were created in the United States in 2020 – the largest number of new businesses recorded to date. The emergence of several types of business that developed in the pandemic was possible precisely due to digitalisation and the evolution of technology [22].

Snežana ŽIVKOVIĆ, Ivana ILIĆ KRSTIĆ, Aleksandra ILIĆ PETKOVIĆ, Marija STOJILJKOVIĆ and Miodrag MILENOVIĆ, in their paper

named JOB SATISFACTION OF NURSES DURING COVID-19 PANDEMIC, discuss job satisfaction of medical workers as an essential element of providing healthcare services. Ample empirical evidence supports the cause-and-effect relationship between employee job satisfaction and patient security and quality of care provided. This paper considers the job satisfaction of nurses during the Covid-19 pandemic with regard to their years of employment, age, professional education, job position, possibility of advancement, relationship with the superiors, and organisation of work. A standardised survey with a job satisfaction scale was used for data collection. The survey was completed from 23 June to 13 July 2020 by 27 out of the 50 nurses working at the Covid-designated hospital in Leskovac, Serbia. The results showed that the employees with fewer years of employment were more satisfied than their more experienced co-workers. The results on the entire job satisfaction scale showed that 2.6% of the respondents were very dissatisfied, 28.3% neither satisfied nor dissatisfied, while only 9.3% were very satisfied with their job. One of the main reasons for such response distribution is the lack of career advancement options. This research found that organisational commitment, job satisfaction, and years of experience are significant predictors of successful work for the nurses [23].

Raluca ZORZOLIU, Mariana IATAGAN and Elena GURGU, in their paper entitled THE ECONOMIC CRISIS CAUSED BY THE COVID 19 PANDEMIC, discuss the fact that in the midst of wave 4 of the pandemic, the demand for commodities seems unbridled, and the value of stock and real estate assets reaches record after record. On the other hand, container bottlenecks in the world's ports, production syncopes against the background of the crisis of raw materials, components and microprocessors, or the explosion of energy prices in Europe are less bright aspects of the period we are living in. The pandemic is not coming to an end, but since the fall of 2020, when most of the movement restrictions have been lifted, the world's population has pivoted unseen from thrift to excess. Inflation at the end of the year will be more than double compared to the last quarter of 2020, according to the NBR projections. According to some analysts, such as Valentin Tătaru, the chief economist of ING Romania, inflation could reach 6% this autumn. The injection of money into the economy, in theory, should only begin from now on, after the approval of the National Recovery and Resilience Plan (PNRR). The almost EUR 30 billion that would help areas such as health, education, energy, construction and transport over the next six years, as well as the capital market, should be a safety net in the most pessimistic scenarios. However, the labour crisis, the resolution of which is not even in the medium term, is the real time bomb that can undermine economic growth and, by extension, the absorption capacity of European funds. The areas with high shortages of specialists are well known – construction, HoReCa, medical services and technology [24].

Foluso Philip ADEKANMBI and Wilfred Isioma UKPERE, in their paper called PERCEIVED ORGANIZATIONAL CULTURE, CO-WORKER SUPPORT, WORK PERFORMANCE, AND EMPLOYEE DEMOGRAPHICS AS CORRELATES OF ORGANIZATIONAL COMMITMENT, investigate the perceived organisational culture, co-worker support, work performance, and employee demographics as correlates of organisational commitment within Nigeria's manufacturing industry. The current sample was taken from ten manufacturing organisations in Oyo and Lagos States of Nigeria. Data retrieved were analysed and presented in tables. This paper applied a cross-sectional survey approach, of which the survey forms were randomly disseminated. Out of 500 surveys, 476 were suitable for investigation and analysed with Statistical Packages for Social Sciences (SPSS vs. 27). The objectives of this paper were to find out if there are correlations between perceived organisational support, co-worker support, work performance, employee demographics, and organisational commitment, and to determine how organisational commitment can be enhanced and made consistent within Nigeria's manufacturing sector. The present results established a strong and significant positive correlation between perceived organisational culture, co-worker support, work performance, employee demographics, and organisational commitment within Nigeria's manufacturing industry. Therefore, the management of manufacturing industries should ensure a good and consistent strategy that makes employees committed to organisational culture, encourage support among co-workers, and enhance work performances [25].

Cleopas FORE and Wilfred Isioma UKPERE, in their paper named AMELIORATING ADVERSE EFFECTS OF GLOBALIZATION ON EMPLOYMENT RELATIONS IN ZIMBABWE discuss the fact that globalisation has been associated with accelerated deregulation and withdrawal of government from the workstation (Sweeney, 2004). The advent of globalisation has forced organisations in Zimbabwe to deal with implications such as loss of market, response to competition, and technological and legislative changes. This conundrum brought about a change in human resources policy, employee compensation, business strategies, among others. These changes have also resulted in massive shift in employment relations between employers and their employees and relations between employees and their unions. Subsequent to this background, this article's objectives are to identify challenges occasioned by globalisation on employment relations in Zimbabwe and proffer mechanisms to ameliorating the adverse effects of globalisation. A qualitative phenomenological research was adopted making use of interviews, researcher field notes and memoirs to gather data on participants' experiences. Results were analysed using Nvivo 10 and manual coding. Results identified six main challenges, namely (1) strife between employers and employees (2) dwindling employee democracy (3) employee marginalisation (4) increased disputes (5) general dissatisfaction of all parties and (6) disunity among unions and workers. The study recommended four mitigating strategies, namely: contextualising globalisation; making use of training and education; increased employee involvement; and use of dialogue and communication. If these factors are considered, a fair globalisation can be achieved [26].

4. Conclusions

The ICESBA 20201 International Online Conference, 6th edition, called: Big Data-driven Smart Urban Economy, organized by the Bucharest Faculty of Economic Sciences, was a real success among the participants. It was a good opportunity to discuss scientific research topics and to make an exchange of high-standard ideas, being a starting point for other events and the establishment of future partnerships in academia.

We hope that a big part of our conference papers caught your attention and propelled you to read them. Also, we strongly believe that all the articles are interesting and deserve to be appropriated by those who are interested in understanding the specific issues of the global economy and big data.

If you have liked the articles, please visit our conference website at icesba.eu or the ASHUES journal website, where all the papers from conference were fully published in their long final form or are now in the process of publication – <http://anale-economie.spiruharet.ro/>. If you want to write an article in ASHUES journal, we invite you to present your ideas in new studies, in order to be published by our international indexed journal [27].

Finally, hoping that you found the ICESBA 2021 International Conference interesting, we strongly invite you to participate in our future editions and also to address your comments and suggestions at icesba@spiruharet.ro and, of course, to submit for publication your own paper via online submission system, using the following link of ASHUES journal: <http://anale.spiruharet.ro/index.php/economics/login> [28] or to address your request for creating an account and credentials in order to publish your paper at ASHUES journal's official email address: ashues@spiruharet.ro.

References

- ICESBA 2021 [cited 2021 Dec 15]. Available from: <http://icesba.eu/Index.html>
- GURGU, E. (2021). "Foreword." *Annals of Spiru Haret University. Economic Series*, 21(4), 21–39, doi: <https://doi.org/10.26458/2140>
- POKORNI, S. (2021). "The Reliability of Data-driven Internet of Things Systems." *Annals of Spiru Haret University. Economic Series*, 21(4), 43–52, doi: <https://doi.org/10.26458/2141>
- ANDRONIE, M., IONESCU, L., & DIJĂRESCU, I. (2021). "How Chatbots Will Impact Public Sector and Accounting." *Annals of Spiru Haret University. Economic Series*, 21(4), 53–61, doi: <https://doi.org/10.26458/2142>
- PERCIUN, R., & AMARFII-RAILEANU, N. (2021). "Industry 4.0 versus Traditional Economy. Republic of Moldova Case Study." *Annals of Spiru Haret University. Economic Series*, 21(4), 63–78, doi: <https://doi.org/10.26458/2143>
- VUJOVIĆ, S., RAĐENOVIĆ, T., & VUJOVIĆ, T. (2021). "The Application of Augmented Reality in Promoting Hotels and Tourist Attractions of the city of Niš." *Annals of Spiru Haret University. Economic Series*, 21(4), 79–96, doi: <https://doi.org/10.26458/2144>
- GURGU, E., ZORZOLIU, R.I., PISTOL, L., GURGU, I.A., UNGUREANU, C., & NAE, G. (2021). "The Relationship Between Big DataDriven Technologies and Performance Management Strategies Applied to Companies in the Hospitality, Tourism & Travel Industry." *Annals of Spiru Haret University. Economic Series*, 21(4), 97–136, doi: <https://doi.org/10.26458/2145>
- NOVAKOVIĆ CAREVIĆ, S., BAŠIĆ, J., & DIJĂRESCU, I. (2021). "AI-Assisted Diagnostics in Health Management." *Annals of Spiru Haret University. Economic Series*, 21(4), 137–143, doi: <https://doi.org/10.26458/2146>
- PELEŠ, M., JEVREMOVIĆ, S., SIMOVIĆ, A., & HADŽIĆ, A. (2021). "Possibilities for Developing and Implementing a Mobile Application for Recognizing the Shape of the Environment, Text, and Reading QR Codes Using the Android Camerax Framework and the Machine Learning KIT." *Annals of Spiru Haret University. Economic Series*, 21(4), 163–179, doi: <https://doi.org/10.26458/2148>
- JEVREMOVIĆ, M., STEFANOVIĆ, H., STOJAKOVIĆ, D., & STALETIĆ, N. (2021). "Can We Predict the Effects of Using the Interactive Features of the Website?." *Annals of Spiru Haret University. Economic Series*, 21(4), 181–192, doi: <https://doi.org/10.26458/214>
- PĂUN, R.D. (2021). "Overview of Some Legal Aspects of Technologies Based on Artificial Intelligence." *Annals of Spiru Haret University. Economic Series*, 21(4), 193–209, doi: <https://doi.org/10.26458/21410>
- KULETO, V., ILIĆ, M., HADŽIĆ, A., & RAKETIĆ, K. (2021). "The Implementation of Extended Reality in Higher Education, Examining Students' Awareness." *Annals of Spiru Haret University. Economic Series*, 21(4), 211–225, doi: <https://doi.org/10.26458/21411>
- 1TOSOVIC, M.N., & JOVANOVIĆ, V. (2021). "The Analysis of Entrepreneurial Intention of Management Students in the Timok Region –Overview of Attitudes and Opinions." *Annals of Spiru Haret University. Economic Series*, 21(4), 227–243, doi: <https://doi.org/10.26458/21412>
- ĐORĐEVIĆ, S., JEVREMOVIĆ, S., TOŠIĆ, J., & STOJANOVIĆ, N. (2021). "Smart house web application: design and implementation using Java EE, MVC framework and Arduino microcontroller." *Annals of Spiru Haret University. Economic Series*, 21(4), 245–260, doi: <https://doi.org/10.26458/21413>
- IORDACHI, V. (2021). "Smart City Development by sustainable digital transformation." *Annals of Spiru Haret University. Economic Series*, 21(4), 261–271, doi: <https://doi.org/10.26458/21414>
- POPA, V., & CIOBANU, M. (2019). "Using Smart Digitization in Hazardous Waste Management." *Annals of Spiru Haret University. Economic Series*, 21(4), 273–290, doi: <https://doi.org/10.26458/21415>
- TIMOFEL, O. (2021). "The Awareness of the Circular Economy Principles in Moldova's Companies." *Annals of Spiru Haret University. Economic Series*, 21(4), 291–301, doi: <https://doi.org/10.26458/21416>
- TOMIC, V., & ANDJELIC, S. (2021). "The Production of Electricity from Renewable Energy Sources in the Republic of Srpska." *Annals of Spiru Haret University. Economic Series*, 21(4), 303–312, doi: <https://doi.org/10.26458/21417>
- ILIĆ, M., POPOVIĆ ŠEVIĆ, N., RANKOVIĆ, M., & BUCEA-MANEA-ȚONIȘ, R. (2021). "Competitiveness and Innovation: The Case Studies of Serbia and Romania." *Annals of Spiru Haret University. Economic Series*, 21(4), 313–326, doi: <https://doi.org/10.26458/21418>
- GÂRDAN, I.P., GÂRDAN, A.G., BAICU, C.G., & JIDOVEANU, D.C. (2021). "A Systematic View Regarding Business Rethinking in the Context of Supply Chains Sustainability." *Annals of Spiru Haret University. Economic Series*, 21(4), 377–397, doi: <https://doi.org/10.26458/21422>
- OZIOMA, O.A.H., & UKPERE, W.I. (2021). "Demand Forecasting as a Veritable Tool for Higher Managerial Efficiency in Industries in Nigeria." *Annals of Spiru Haret University. Economic Series*, 21(4), 417–438, doi: <https://doi.org/10.26458/21424>
- CRETOIU, R.I., UNGUREANU, A., UNGUREANU, A., & MIHALI, A.M. (2021). "New Types of Business Developed in the Pandemic." *Annals of Spiru Haret University. Economic Series*, 21(4), 455–465, doi: <https://doi.org/10.26458/21426>
- ŽIVKOVIĆ, S., ILIĆ KRSTIĆ, I., ILIĆ PETKOVIĆ, A., STOJILJKOVIĆ, M., & MILENOVIĆ, M. (2021). "Job Satisfaction of Nurses During Covid-19 Pandemic." *Annals of Spiru Haret University. Economic Series*, 21(4), 467–477, doi: <https://doi.org/10.26458/21427>
- ZORZOLIU, R., IATAGAN, M., & GURGU, E. (2021). "The Economic Crisis Caused by the COVID-19 Pandemic." *Annals of Spiru Haret University. Economic Series*, 21(4), 479–487, doi: <https://doi.org/10.26458/21428>
- ADEKANMBI, F.P., & UKPERE, W.I. (2021). "Perceived Organizational Culture, Co-worker Support, Work Performance, and Employee Demographics as Correlates of Organizational Commitment." *Annals of Spiru Haret University. Economic Series*, 21(4), 529–547, doi: <https://doi.org/10.26458/21431>
- FORE, C., & UKPERE, W.I. (2021). "Ameliorating Adverse Effects of Globalization on Employment Relations in Zimbabwe." *Annals of Spiru Haret University. Economic Series*, 21(4), 595–621, doi: <https://doi.org/10.26458/21435>
- Annals of Spiru Haret Economic Series* [cited 2021 Dec 15]. Available from: <http://anale-economie.spiruharet.ro/>
- Annals of Spiru Haret Economic Series Link* [cited 2021 Dec 15]. Available from: <http://anale.spiruharet.ro/index.php/economics/login>



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RE-FOOD: Zajednički pokret baziran na umrežavanju volontera

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Apstrakt: Re-Food je pokret podstaknut dobrom voljom društvene zajednice čiji je cilj da se smanji glad borbom protiv bacanja hrane. Nastao na osnovu angažmana samo jedne osobe, pokret Re-Food je izrastao u nevladinu organizaciju [NVO], sa statusom privatne institucije socijalne solidarnosti [PISS]. Putem saradnje realizovane preko mreža, Re-Food predlaže da se ostvari ravnoteža između potražnje i snabdevanja prehrambenim proizvodima. Strategija pokreta Re-Food zasniva se na redistribuciji primljenih donacija. Sva donirana hrana se odmah distribuira i ne postoje zalihe o kojima bi trebalo voditi računa. Kada bi se pojavio višak hrane za redistribuciju, trebalo bi razmotriti postojanje održive mreže saradnika sa značajnim ekonomskim, društvenim i ekološkim uticajem. Održiva mreža saradnika nastaje zahvaljujući volonterskom radu. Osnovni cilj ovog rada je da istraži saradničku mrežu organizacije Re-Food. Primjenjena je kvalitativna metodologija i obavljani su razgovori sa izvršnim direktorom [R] i koordinatorom operativnog centra organizacije Re-Food [C]. Osim toga, direktna opservacija i analiza dokumenata potkrepljuju istraživanje. Najvažniji rezultat ukazuje na model liderstva zasnovanog na prihvatanju različitih sposobnosti i motiva zaposlenih. A tehnologija može povećati efekte i efikasnost umrežavanja, odnosno poboljšati komunikaciju među ljudima.

Ključne reči: Re-Food; motivacija–mogućnost–sposobnosti; propadanje i bacanje hrane; saradnička mreža; volonteri

1. Uvod

Globalna inicijativa za žetvu [GHI] predviđala je da će svetska populacija brojati oko 9,8 milijardi stanovnika do 2050. godine [1]. Međutim, procenjuje se da 821.000.000 ljudi pati od nedostatka hrane [2]. Osim toga, količina jestivih a nekonsumiranih delova biljaka i životinja koja se ne iskoristi ili baci dostiže čak jednu trećinu proizvodnje. Smanjivanje količine hrane koja se ne iskoristi i baci može biti način za borbu protiv gladi [3]. Kada se radi o uticaju, smatra se da otpaci hrane imaju uticaj u svim fazama procesuiranja hrane – od proizvodnje do odlaganja [3]. Ovaj uticaj se negativno reflektuje ne samo na ekonomskom nivou već i na nivou ekologije i društva. Štavišekom kombinacija faktora koji se povezuju sa ekonomskim rastom može dovesti do porasta količine bačene hrane, te može imati negativan uticaj na čovekovo okruženje [4].

Imajući na umu postojeću neravnotežu u distribuciji hrane i njen negativan uticaj na više nivoa, postavljeno je sledeće pitanje: Da li je moguće suzbijati bacanje hrane, a istovremeno smanjivati glad? Pokret Re-Food stvoren je zahvaljujući dobroj volji svog osnivača. Važnost ove teme i ovog stava imala je snažan uticaj na širenje koje je rezultiralo stvaranjem nevladine (neprofitne) organizacije. Re-Food je jedinstvena organizacija. Razlikuje se po tome što se u potpunosti zasniva na naporu volontera. Ova institucija pokušava da pomogne ljudima koji se muče, koji nemaju sredstava da kupe hranu. Osim nedostatka hrane, pojedinci imaju i drugih problema, kao što je nezaposlenost.

U nastojanju da se istraži saradnički, volonterski, umreženi model organizacije Re-Food, sprovedeno je istraživanje. Ova studija nudi dublje razumevanje složene i nedovoljno istražene vrste organizacija kakva je Re-Food, koja u potpunosti zavisi od volonterskog rada. U okviru ovog istraživanja obavljena su dva detaljna intervjua sa izvršnim direktorom [R] i koordinatorom operativnog centra organizacije Re-Food [C]. Dobijene informacije su upoređene sa viđenjem koordinатора operativnog centra institucije. Ova neprofitna institucija ima sistem redistribucije viškova hrane, čime se uglavnom nastoji da se smanji glad kod ljudi koji ne mogu da priušte da kupe hranu. Ovaj pokret, uz podršku dobre volje zajednice, uglavnom je zasnovan na redistribuciji kao zajedničkom radu, gde se prikupljena hrana deli na dnevnom nivou i gde se ništa ne skladišti.

Ovaj članak opisuje situaciju iz ugla menadžera. Predstavlja preliminarno istraživanje. Glavni cilj ovog rada je da bude polazište sveobuhvatnog/šireg budućeg istraživanja. Struktura ovog rada data je kroz model motivacija– mogućnost– sposobnosti [MMS] [5] da bi se ocenile motivacija i mogućnosti, kao i stvaranje mreže saradnika u vezi sa problemom bacanja hrane. Metodologija je zatim definisana, a dobijeni rezultati prezentovani. Konačno, završni stavovi su objašnjeni, uz uzimanje u obzir postojećih ograničenja i praktičnih implikacija.

2. Motivacija–mogućnost–sposobnosti [MMS]

Godinama se praksa bacanja hrane smatra nevažnim [6]. Potrebno ju je vratiti, smanjiti njenu upotrebu, reciklirati je i ponovo upotrebljavati [7]. S tim u vezi, Işanguljev, Kim i Li (Işangulyyev, Kim and Lee) [8] predlažu: doniranje hrane koja nije prodana u menzama i restoranima; uvođenje kampanja o bezbednosti hrane i edukaciju konzumenata; smanjenje porcija hrane; obuke za način štednje na nivou domaćinstva; uključivanje žena u kampanje o bezbednosti hrane; efikasnu upotrebu ostataka obroka; obuke za upravljanje restoranima, kafeterijama i supermarketima (razmišljanje pre potraživanja); uvođenje dobre prakse

čuvanja hrane; ispravno tumačenje roka trajanja; distribuiranje viška hrane grupama koje žive u oskudici.

Za hranu koja se doživljava kao ona koja propada, kao ona čiji kvalitet opada, na primer sitna oštećenja koja utiču na izgled, ili kao ona koja je odbačena pre konzumiranja, koristi se termin „neiskorišćena hrana“ (food loss) i smatra se neplaniranim ishodom, dok se termin „otpaci hrane“ (wastage of food) koristi za hranu za koju se vezuje ishod svesne odluke [9]. Hrana može biti odbačena pre kuvanja, u sirovom stanju ili kada je delimično skuvana, a može biti odbačena i posle kuvanja. Međutim, hrana odbačena u procesu proizvodnje, distribucije, odnosno u okviru usluga i prodaje, u literaturi se smatra „odbačenom hranom“ (food waste) [10]. Zato se može reći da takva odbačena hrana (food waste) još uvek zadržava izvestan kvalitet i može biti pogodna za konzumiranje [9].

Kako bi se istražio model volonterskog rada organizacije Re-Food, konceptualni okvir koji je smatran pogodnim za primenu na volonterski rad, pre svega na volontiranje u vezi sa odbačenom hranom, bio je konceptualni model MMS (engl. MOA), s obzirom na to da se tiče povezanih determinanti na individualnom i društvenom planu [5]. U osnovi ove teorije je namera pojedinca, koja zavisi od svakoga, ukazuje na subjektivnu sposobnost pojedinca da nešto uradi (ili ne uradi) i pod uticajem je posledica konkretnog ponašanja [11].

Namera jača ako postoji pozitivan stav prema nekom obliku ponašanja, kao i percepcija tog ponašanja od strane drugih pojedinaca. Međutim, verovanja korespondiraju sa subjektivnim vrednosnim sudom, poimanjem ili svojstvom za koje pojedinac veruje da poseduje i to verovanje je podržano posledicama sprovođenja ili nesprovođenja konkretnog ponašanja [12]. Stav je povezan sa evaluacijom i zavisi od verovanja pojedinca [13], i ukazuje na predispozicije pojedinca da oseća, misli i dela [14]. Percepciju drugih ili normativna uverenja definisali su Fišbejn i Ajzen (Fishbein i Ajzen) 1975. kao očekivanja ili društveni pritisak koji utiče na percepciju. Odobravanje grupe u koju je pojedinac uključen može uticati na ponašanje pojedinca. Subjektivna norma se može definisati kao ponašanje uslovljeno percepcijom društvenog pritiska [13]. Čak i da su verovanja tendenciozna, tačna ili netačna, jasna ili nejasna, racionalna ili iracionalna, ishodi koje proizvode stavovi, namere ili ponašanje biće u skladu sa verovanjem pojedinca [15].

S druge strane, mogućnosti (svesne, eksplicitne) bile su definisane kao funkcije koje su preduslov za ponašanje. Osim toga, pojam kapaciteta, koji može da podrži ideju o iskorišćavanju „mogućnosti“, bio je uključen u model. Motivacija je definisana kao kognitivni faktor (implicitan, nesvestan) [16]. Imajući na umu da je korišćen za ocenjivanje ponašanja koje dovodi do bacanja hrane i da kombinuje faktore koji su u vezi sa verovanjima (individualnim, društvenim), mogućnostima (svesnim, eksplicitnim) i kognitivnom motivacijom (implicitna, nesvesna) [17], model MMS (MOA) smatran je odgovarajućim modelom za ovo istraživanje. Međutim, pošto je po ovom modelu motivacija neophodna za voljno ponašanje, kao što je smanjenje otpada, glavni cilj ove studije jeste buđenje motivacije za stvaranje saradničke mreže radi obavljanja volonterskog rada. Štaviše, može se tvrditi i da je uticaj ovakvog volonterskog rada značajan na tri polja: na ekonomskom, društvenom i ekološkom.

3. Mreža saradnika

Međusobni odnosi postepeno razvijaju posvećenost [18–20], a mnogi autori, kao [21–23], smatraju sociopsihološke aspekte značajnim. Potrebno je poverenje da bi postojala dinamika unutar ličnih odnosa [24, 25]. U oblasti socijalne psihologije razvijena je važna studija o internim organizacionim odnosima [26, 27], kao i teorija socijalne razmene [28, 29]. Lični odnosi oslanjaju se na konstrukte poput poverenja, prijateljstva, posvećenosti, deljenja vrednosti i verovanja kao ključnih elemenata u procesu stvaranja mreže.

Studija se oslanja na volonterski rad čija je glavna motivacija da se pomogne zajednici [30]. Na osnovu studije koju je razvio autor [30], kako bi se obezbedio najbolji volonterski rad, potrebno je uključiti neke metode za regrutovanje volontera kao što su otvoreni pozivi, usmene preporuke, organizovano regrutovanje. Štaviše, komplementarne saradničke mreže mogu doprineti dobrobiti koju donosi različitost [31]. Lična reputacija, identifikacija sa grupom i zajednička spremnost da se dela imaju različite efekte na motivaciju, a motivacija tima ima poseban efekat kao regulator odnosa [32]. Osim toga, fleksibilnost je neophodna da bi se povezali ljudi, takođe i stalna komunikacija [33], a spoljna motivacija je ključan faktor za razmenu znanja unutar mreže [34].

Unutrašnja motivacija ima uticaj na sposobnost apsorpcije na tri polja: prepoznavanje, asimilacija i eksploatacija, dok spoljašnja motivacija treba da bude multidimenzionalni konstrukt [35]. Literatura naglašava pozitivnu interakciju između položaja unutar mreže i unutrašnje motivacije [36]. U nastojanju da se postignu najbolji rezultati, timovi bi trebalo da budu što je moguće više homogeni. Autori su identifikovali da zalaganje utiče na intervencije, a indirektno utiče i na nastup jedinke.

Organizacije treba da razmotre različite modele radne snage, kao što je volontiranje na primer, kako bi podržale najraznovrsnije inicijative [38]. Pored toga, volonteri žele društvene kontakte, samostalan razvoj, uvažavanje i podršku. Saradničke mreže koje se pojavljuju podstaknute su društvenim kapitalom [39]. Tehnologija može povećati efikasnost i efektivnost umrežavanja, a može poboljšati i komunikaciju među ljudima. Veoma je važno znati da uvođenje tehnologije, putem korišćenja nekih logističkih platformi i alata, društvenih mreža na primer, može doprineti ostvarenju značajnih pozitivnih rezultata. Prednost uvođenja tehnoloških alata može doprineti ne samo razvoju snažnih već i dugoročnih odnosa. Mreže koje su bazirane na snažnim vezama doprineće rastu donora hrane, dobrotvornih organizacija i volonterskog rada, što će omogućiti da se dostavi više hrane.

4. Materijali i metode

Konceptualni okvir studije zasnovan je na okviru motivacija–mogućnost–sposobnost. Ovaj model je odabran iz nekoliko razloga. Prvo, zato što se tiče motivacije. Imajući na umu da ne postoji kompenzacija, ova varijabla je ključna kako bi se shvatili razlozi koji dovode do volonterskog rada. Drugo, zato što predstavlja postojeće mogućnosti, a volonterski rad se može uklopiti sa ličnim i profesionalnim načinom života. Treće, zato što zahteva važne veštine i kompetencije za obavljanje posla.

Model pokreta Re-Food dovoljno je inkluzivan i fleksibilan. Kada se lična posvećenost preklopi sa volonterskim radom, rad u timu dozvoljava redefinisane aktivnosti. Drugim rečima, ova mreža je strukturirana tako da se bavi nepredvidljivim problemima. Konačno, ove varijable su najznačajnije varijable ove mreže. Pored toga, ovaj model je već testiran na sličnim oblicima dobrovoljnog ponašanja. Zasnovan na volonterskoj mreži, Re-Food je uspešan pokret koji se bazira na dobroj volji zajednice. To je neprofitna organizacija sa sistemom za redistribuciju viškova hrane. Misija ove organizacije je usmerena na smanjivanje gladi. Tu postoji strategija redistribucije koja je bazirana na saradnji – sva hrana se distribuira na dnevnom nivou i ne postoje zalihe koje bi trebalo čuvati. Glavni cilj ovog rada je da se razume uspeh volonterske mreže i da se ona replicira u nekom drugom važnom i relevantnom kontekstu. Ova studija je pokušala da razume i model vođe.

U želji da se istraži kooperativno-volonterski model organizacije Re-Food, intervjuisan je izvršni direktor. Dobijene informacije su upoređivane sa viđenjem koordinatora operativnog centra dobrotvorne organizacije. Obavljeni su razgovori sa dve osobe: 1) jedna je povezana

sa operativnim centrom za distribuciju hrane ljudima kojima je potrebna (dnevni višak); 2) druga osoba je osnivač i izvršni direktor organizacije.

Ne postoji saglasnost među autorima u vezi sa idealnim brojem intervjua [40]. U skladu sa ovim specifičnim slučajem i stavom [41] da su neophodna dva intervjua, ovo istraživanje se odlučilo za dva detaljna razgovora, sa izvršnim direktorom i koordinatorom operativnog centra organizacije Re-Food. Razgovori su snimljeni i njihov sadržaj je transkribovan. Identifikovani su relevantni faktori modela organizacije Re-Food, što je omogućilo autorima da adaptiraju ovaj model kako bi odgovarao drugim važnim situacijama.

Razgovori su sadržavali pitanja otvorenog, odnosno polustrukturiranog tipa, zasnovanog na varijablama, a napravljen je i vodič za vođenje intervjua. Razgovori su snimljeni, transkribovani i analizirani u skladu sa sledećim varijablama: 1) verovanja – individualna i društvena; 2) mogućnosti; 3) motivacija; 4) faktori koji doprinose razvoju mreža. Različiti izvori informacija su dodati kako bi se podržalo istraživanje kao direktno posmatranje, a takođe i različiti dokumenti. Razgovori su analizirani i dobijene informacije su pružile uvid u presek varijabli. Saradnička mreža zasnovana na volonterskom radu može se smatrati održivom u dužem periodu s obzirom na to da ne zahteva mnogo resursa i da umesto toga koristi viškove.

5. Rezultati

Istraživanje faktora bilo je fokusirano na dimenzije varijabli: verovanja – individualna i društvena, mogućnosti, motivacija i faktori koji podržavaju formiranje mreža.

5.1. Verovanja

Glavno verovanje identifikovano u ovom istraživanju bio je mit o sličnosti između volonterskog i plaćenog rada. U organizaciji Re-Food dobrovoljni rad zahteva odgovornost, a poslovni model organizacije Re-Food podrazumeva da postoji više od jedne osobe koja obavlja isti zadatak, što omogućava momentalnu zamenu osobe, čak i u slučajevima kada je ta promena neočekivana. Tako da za izvršnog direktora organizacije Re-Food postoje dva modela volonterskog rada – klasičan i model Re-Food: „... volonteri moraju biti super odgovorni ... moraju se odnositi prema tome kao prema poslu! Tako da je to klasična teorija ... [R] ima drugačiju teoriju ... a to je da je svako različit i da svako ima vrednost! Imaćemo volontere od pet zvezdica, odnosno volontere koji pokazuju dobru volju, koji donose entuzijazam, koji su na raspolaganju, koji su odgovorni i koji poseduju odgovarajuće kompetencije. Postoje takvi volonteri, i mi smo srećni što ih imamo, ali postoje i drugi volonteri, koji imaju četiri kvaliteta od navedenih. Drugi imaju tri, neki imaju dva, a neki samo jedan. U Re-Foodu ih sve smatramo vrednim ... mi imamo otvoren model. Svi ljudi su dobrodošli!”

Iako je model fleksibilan, manji operativni centri imaju izvesne teškoće. Za [C] „... volontiranje u Re-Foodu je otvoreno! Kad kažem da je otvoreno, mislim da vam ne treba nikakva posebna kvalifikacija niti posebna tehnička veština da biste radili. Očigledno je da postoje karakteristike koje tražimo i koje nastojimo da podstaknemo ... kod onih koji nam se pridruže kao volonteri, ali to su karakteristike koje su zajedničke, koje su rezultat dobre volje, pristojnog ponašanja, ljubavi prema bližnjem ... svako može biti volonter!”

Izvršni direktor organizacije Re-Food kaže da morate poznavati ljude jer, na primer, ako biste Afrikancu ponudili supu, a supa se iz kulturoloških razloga ne uklapa u njihove navike u vezi sa ishranom, ovi pojedinci ne bi imali osećaj da su nahranjeni: „... i onda primamo te ljude, razgovaramo sa njima ... znajući šta oni ne mogu da jedu ili neće pojesti ... ljudi iz Afrike veoma često ne jedu supu jer ona nije deo njihove kulture. Tako da, ako im date supu, niste ih nahranili ... bolje je znati to i dati im hranu koju će pojesti.”

5.2. Mogućnosti

Izuzetno je važno uključiti celu zajednicu da istraži mogućnosti u odnosu na viškove hrane i istovremeno identifikuje ljude koji oskudevaju u hrani. Osim toga, sav rad se zasniva na dobrovoljnom radu i dobroj volji, stoga je neophodno da se uključi zajednica kako bi svi sarađivali na otvoren i fleksibilan način. Prema mišljenju [C], „... to je proces koji uključuje celokupnu zajednicu ... pojačava dinamiku međusobnih društvenih odnosa, produbljuje veze solidarnosti ... što transformiše tu odbačenu hranu ... u korist onih kojima je potrebna.”

5.2.1. Prijavljene mogućnosti u vezi sa nabavkom i potražnjom hrane

Kada se radi o nabavci, neophodno je identifikovati viškove hrane koju ljudi mogu konzumirati. Mišljenje izvršnog direktora organizacije Re-Food je sledeće: „Svaka radnja ... ima svoj dnevni ciklus ... tako da postoje ta dva trenutka u ciklusu svakog proizvođača hrane, a to je momenat kada hrana gubi svoju komercijalnu vrednost i nešto kasnije, kada gubi svoju hranljivu vrednost ... mi nastupamo između ta dva trenutka ... tu leži naša mogućnost.” Postoje različiti formati za identifikovanje partnera i moguće ih je pozvati direktno ili indirektno, formalno ili neformalno. Prema mišljenju intervjuisanog [C]: „... poziv poslovnim organizacijama ... sav dnevni višak hrane ... koji bi te organizacije bile spremne da učine dostupnim centru...”

Ponekad se organizuju događaji kako bi se prezentovao rad koji razvija Re-Food i na taj način se uključuju kompanije, pojedinci, ali i cela zajednica. [C] je objasnio: „... mi pozivamo ... direktno, putem događaja, okupljamo partnere ... kompanije povezane sa restoranima i slično, velike distributerske kompanije, supermarkete, hipermarkete, male i lokalne prodavnice namirnica ... i šaljemo pozive bilo putem ličnih kontakata ili preko volontera, ili kontaktiramo s njima, recimo, na formalniji način, pozivom putem mejla ili pisma...”

Kada se radi o potražnji, potrebe se mogu identifikovati putem mreže kontakata volontera ili putem zahteva za pomoć koje upućuju pojedinci. Moguće je, takođe, identifikovati potrebe drugih humanitarnih organizacija. [C] je izjavio: „... upoznajte ljude preko kruga njihovih prijatelja ... ljude koji su u nevolji ... sam centar prilazi ljudima s ciljem utvrđivanja da li bi ti ljudi bili zainteresovani za primanje pomoći ... Takođe, postoji i oblik samopomoći za pojedince ... ljudi, znajući za naše postojanje, sami dolaze do nas. Postoji i upućivanje preko drugih ustanova socijalne solidarnosti ... i one rade na socijalnom tržištu ... četvrti sektor, kako ih sad zovu.”

5.3. Motivacija

Mogućnosti ne bi značile mnogo ako ljudi ne bi bili motivisani da rade, posebno kada je reč o volonterskom radu. Međutim, da bi bilo stimulacije, volonterski rad ne sme predstavljati društveni pritisak. Naprotiv, model organizacije Re-Food omogućava svakom

volonteru da uklopi svoje privatne i profesionalne obaveze. Prema mišljenju [C], „... projekat Re-Food je inkluzivan projekat. To znači da sve njegove aktivnosti počinju pozivom na akciju, pozivom upućenim svakoj osobi!“. Imajući na umu da se javljaju teškoće, poslovni model organizacije Re-Food veoma je fleksibilan. Navodimo reči izvršnog direktora organizacije Re-Food: „Kada neko izostane i vrati se sledeće nedelje, mi ne kažemo ... 'Sve si upropastio' ... mi kažemo: 'Hej, drago nam je da si tu. Hajde da radimo!'“

5.3.1. Faktori koji doprinose formiranju mreža

Prvi faktor koji je identifikovan kao onaj koji doprinosi formiranju mreže jeste usvajanje inkluzivnog modela. Fleksibilnost je ključna reč. I čini se da je odluka o prihvatanju različitosti bila dobra. [C] je zagovarao sledeći stav: „Svako je dobrodošao!“, a izvršni direktor organizacije Re-Food je uključio druge organizacije na lokalnom nivou, tvrdeći da ove institucije poznaju ljude u nevolji, ljude kojima je potrebna hrana: „... mnogo je institucija koje mogu da deluju lokalno i koje poznaju porodice kojima je potrebna podrška.“ Drugi identifikovani faktor bio je stvaranje modela koji se može ponavljati. Po mišljenju [C], „... ovaj projekat ... je već po svojim dimenzijama prevazišao granicu, i stoga je postao internacionalan, i već postoje centri koji rade u Španiji, Italiji, a takođe i u Latinskoj Americi...“.

Obezbediti hranu za pojedince u vreme nestašice hrane je veoma važno. To je deo misije organizacije Re-Food. I to se mora realizovati za kratko vreme. Međutim, i srednjoročne i dugoročne alternative se moraju identifikovati. Ljudi koji su proaktivni u svom delovanju, otvorenog uma i sposobni za inovacije omogućuju da poslovni model otkloni uzroke problema i vrati dostojanstvo ljudima. U tom smislu, treći veoma važan faktor za formiranje mreža je identifikovan: volonteri i njihove veštine. [C] je izjavio: „... mi čak imamo i tehničare za praćenje, jer takođe procenjujemo mogućnosti kako možemo, ne samo u hrani, pomoći ovim ljudima da izađu iz takve situacije.“ Glavni rezultat je postignut: mreža zasnovana na modelu volonterskog rada, koja ima fleksibilan liderski model i koja prihvata zaposlene sa različitim kapacitetima i integriše ih u institucije. Uloga svakog člana mreže se može definisati u odnosu na njihove različite motive.

6. Zaključci

Organizacija Re-Food bavi se ljudima sa različitim bazičnim potrebama, pre svega onom u vezi sa hranom, ali i ekonomskim i socijalnim potrebama. Autori su odlučili da ne obavljaju razgovore sa tim ljudima zbog osetljivosti koju ova tema izaziva. Metodologija bi bila unapređena kada bi i ovi ljudi bili ispitani. Međutim, ova tema je isuviše važna da bi bila izbegnuta. Štaviše, način vođenja organizacije smatra se najvažnijim faktorom za razumevanje inkluzivnog modela organizacije Re-Food.

Sadašnja aktivnost doprinosi saradničkoj volonterskoj mreži sakupljanja odbačene hrane na nekoliko načina. Upoređivanje organizacije Re-Food sa drugim institucijama je težak zadatak. Re-Food je organizacija koja se doslovno bazira na volonterskoj mreži i pretpostavkama kao što su timski rad, inkluzija i fleksibilnost. Rezultat ovakvog modela je da se pojedinci i organizacije u sve većoj meri uključuju u njen rad.

Najbolji izbor bi bila prevencija kada je reč o odbacivanju hrane. Izbegavanje odbacivanja hrane bi donelo najbolje rezultate u smislu društveno-ekonomskog uticaja, kao i uticaja na čovekovo okruženje. Aktivnosti banke hrane i praksa deljenja hrane klasifikuju se kao ponovna upotreba. Recikliranje ili povraćaj hrane uključuje proizvodnju hrane za životinje i kompostiranje, te se smatraju vrednim i preporučenim oblicima prakse, odnosno praksom povraćaja koja doprinosi prevenciji kada je reč o odbacivanju hrane. Pošto se saradnički volonterski model organizacije Re-Food smatrao uspešnim, sprovedeno je kvalitativno ispitivanje radi istraživanja najvažnijih faktora u vezi sa pokretom Re-Food. S ciljem da se prezentuju primeri dobre prakse u borbi protiv odbacivanja hrane, obavljeni su direktna opservacija i detaljni razgovori kako bi se istražile aktivnosti koje su već implementirane u Portugalu. Intervjuisani su izvršni direktor, kao i koordinator operativnog centra institucije. Moguće je učiti na osnovu primera dobre prakse, pre svega kada su oni povezani sa relevantnim temama kao što je borba protiv odbacivanja hrane. Kao zaključak se može navesti da postoje dve glavne prednosti ove organizacije: nema skladištenja hrane i zasnivanje na volonterskom radu.

Osim toga, imajući na umu potrebe i neophodnost smanjenja gladi među ljudima koji pate zbog nedostatka hrane, Re-Food je neprofitna institucija čiji je model zasnovan na strategiji saradnje, te integriše snabdevanje i potražnju. Viškovi i donirana hrana se distribuiraju na dnevnoj bazi i ništa se ne skladišti. Nema skladištenja. A sve aktivnosti u vezi sa donacijama, organizacijom i distribucijom bazirane su na volonterskom radu. Sistem redistribucije viškova hrane u organizaciji Re-Food u potpunosti se odvija na volonterskoj bazi. Ovo istraživanje možda ne ide toliko u širinu, ali je obavljeno jer omogućava čitaocima da uče na osnovu uspešne prakse opisane u studiji slučaja.

Među otkrićima naglašavamo: 1) mit o sličnosti između volonterskog i plaćenog posla; 2) model organizacije Re-Food koji je inkluzivan, otvoren i fleksibilan; 3) mogućnosti organizacije kada se radi o nabavci hrane i nastojanju da se identifikuju viškovi hrane čiji je kvalitet takav da je ljudi mogu konzumirati; 4) određene mogućnosti kada je reč o potraživanju hrane, sa višestrukim načinima da se prepoznaju različite potrebe, te da se usklade lične i profesionalne obaveze volontera, što pruža različitu motivaciju da se osoba posveti volonterskom radu. Ovo istraživanje nam dozvoljava da damo sledeću preporuku: prvo, budite inkluzivni, volonterski rad ne može biti bolna obaveza; drugo, putem jednostavnih rešenja i balansa moguće je nahraniti sve ljude i pomoći im da prevaziđu teške trenutke; treće, mreže su se pokazale kao odličan način da se povežu ljudi koji se međusobno dopunjuju. Deljenje saznanja nam omogućava da optimizujemo rezultate iz dostupnih resursa, koji su označeni kao važni ali nedovoljni.

Konačno, imajući na umu da se ovaj pokret održava zahvaljujući dobroj volji svih učesnika, da ne zahteva mnogo resursa i da koristi viškove hrane, ova mreža, zasnovana na volonterskom radu, može se smatrati održivim modelom dugoročno gledano. Osim toga, trebalo bi smatrati značajnim uticaj te mreže, koja redukuje negativne posledice kada se radi o sva tri aspekta održivosti: društvenom, ekonomskom i ekološkom.

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Reference

1. Global Harvest Initiative [GHI]. Agriculture for a Healthy Sustainable World. Global Agricultural Productivity Report® (GAP Report®). Ed. Ann Steensland & Margaret Zeigler. GHI Washington, D.C.; 2018. Retrieved from https://globalagriculturalproductivity.org/wp-content/uploads/2019/01/GHI_2018-GAPReport_FINAL-10.03.pdf
2. FAO, IFAD, UNICEF, WFP and WHO. The State of Food Security and Nutrition in the World 2018. Building climate resilience for food security and nutrition. Rome, FAO. ISBN 978-92-5-130571; 2018. Retrieved from <http://www.fao.org/3/I9553EN/i9553en.pdf>
3. Kitinoja L. Innovative Approaches to Food Loss and Waste Issues. Frontier Issues Brief submitted to the Brookings Institution's Ending Rural Hunger project; 2016. <https://www.endingruralhunger.org/>
4. De Laurentiis V, Hunt D, Rogers C. Overcoming Food Security Challenges within an Energy/Water/Food Nexus (EWFN) Approach. Sustainability; 2016; 8(1): 95. Retrieved from <https://doi.org/10.3390/su8010095>
5. Ölander F, Thøgersen J. Understanding Consumer Behaviour as Prerequisite for Environmental Protection. Journal of Consumer Policy; 1995; 18: 345–385. Retrieved from <https://doi.org/10.1007/BF01024160>
6. Imbert E. Food waste valorization options: opportunities from the bioeconomy. Open Agriculture; 2017; 2(1): 195–204. DOI 10.1515/opag-2017-0020.
7. David A, Thangavel Y. D, Sankriti R. Recover, Recycle and Reuse: An Efficient Way to Reduce the Waste. International Journal of Mechanical and Production. Engineering Research and Development (IJMPERD); 2019; 9(3): 31–42. ISSN(P): 2249-6890; ISSN(E): 2249-8001.
8. Ishangulyyev R, Kim S, Lee S. H. Understanding Food Loss and Waste—Why Are We Losing and Wasting Food? Foods; 2019; 8: 297. DOI:10.3390/foods8080297.
9. Lipinski B, Hanson C, Lomax J, Kitinoja L, Waite R, Searchinger T. Reducing food loss and waste. World Resources Institute Working Paper; 2013; p. 1–40. Retrieved from https://wriorg.s3.amazonaws.com/s3fs-public/reducing_food_loss_and_waste.pdf
10. Mena C, Adenso-Díaz B, Yurt O. The causes of food waste in the supplier–retailer interface: Evidences from the UK and Spain. Resources, Conservation and Recycling; 2011; 55(6): 648–658. Retrieved from http://analyseplatformen.dk/Data/madspildsmonitor/HTML_madspildsplatform/assets/menaet-al_2011_the-causes-of-food-waste-in-the-supplier-retailer-interface_evidences-from-theuk-and-spain.pdf
11. Fishbein M, Ajzen I. Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research. Menlo Park, California: Addison-Wesley Publishing Company; 1975. ISBN 0201020890. Retrieved from <http://www.people.umass.edu/aizen/fea1975.html>, 21/12/2010)
12. Zawawi S. N. H. M, Jusoff K, Rahman R. A, Idris K. M. Behavioural Intention for Fraudulent Reporting Behaviour Using Cognitive Theory. Asian Social Science; 2008; 4(7). Retrieved from <http://www.ccsenet.org/journal/index.php/ass/article/view/1369/1332>, 22/12/2010)
13. Fraser R. T, Johnson K, Hebert J, Ajzen I, Copeland J, Brown P, Chan F. Understanding employers' hiring intentions in relation to qualified workers with disabilities: preliminary findings. Journal of occupational rehabilitation; 2010; 20(4): 420–426. DOI:10.1007/s10926-009-9220-1.
14. Aleassa H, Pearson J. M, McClurg S. Investigating Software Piracy in Jordan: An Extension of the Theory of Reasoned Action. Journal of Business Ethics; 2010; 98(4): 663–676. DOI:10.1007/s10551-010-0645-4.
15. Geraerts E, Bernstein, D. M, Merckelbach H, Linders C, Raymaekers L, Loftus E. F. Lasting false beliefs and their behavioral consequences. Psychological Science; 2008; 19(8): 749–753.
16. Egmond C, Bruel R. Nothing is as practical as a good theory. Analysis of theories and a tool for developing interventions to influence energy-related behaviour; 2007.
17. Van Geffen E. J, Van Herpen H. W. I, Van Trijp J. C. M. Quantified consumer insights on food waste: Pan-European research for quantified consumer food waste understanding: D1.4. REFRESH; 2017. Retrieved from https://eurefresh.org/sites/default/files/REFRESH%202017%20Quantified%20consumer%20insights%20on%20food%20waste%20D1.4_0.pdf
18. Andersson R. G. The Birth Process of a New Organization: The Case of a Joint Venture. Paper of Växjö University College. Suécia; 1979.
19. Morgan R. M, Hunt S. D. The Commitment-Trust Theory of Relationship Marketing. Journal of Marketing; 1994; 58: 20–38.
20. Holm D. B, Eriksson K, Johanson J. Business Networks and Cooperation in International Business Relationships. Journal of International Business Studies; 1996; Special Issue: 1033–1053.
21. Cook K. S, Emerson R. M. Power, Equity and Commitment in Exchange Networks. American Sociological Review; 43: 721–739.
22. Woolthuis R. K. Entrepreneurial Activity Through Inter-organizational Relationships – A Longitudinal Approach to IOR Development, paper presented at RENT X. Brussels; 1996.
23. Varamäki E, Pihkala T. A Hotel of Small Firms – An Oddity of SME-Networking, proceedings do International Council for Small Business. 42nd World Conference in Entrepreneurship the Engine of Global Economic Development. San Francisco; 1997.
24. Nooteboom B. Trust, Opportunism and Governance: A Process and Control Model. Organization Studies; 1996; 17(6): 985–1010.
25. Hirschman A. O. Against Parsimony: Three Easy Ways of Complicating Some Categories of Economic Discourse. American Economic Review; 1984; 74(2): 88–96.
26. Johannisson B. Beyond Process and Structure: Social Exchange Networks. International Studies of Management and Organisation; 1987; 17(1): 3–23.
27. Johannisson B. Economies of Overview-Guiding the External Growth of Small Firms. International Small Business Journal; 1990; 9(1): 32–44.
28. Blau P. The Hierarchy of Authority in Organizations. American Journal of Sociology; 1968; 73(4): 453–467.
29. Wayne S. J, Shore L. M, Linden R. C. Perceived Organizational Support and Leader-Member Exchange: A Social Exchange Perspective. Academy of Management Journal; 1997; 40(1): 82–111.
30. Farwell M. M, Handy F. Putting the Community in Community-Based Human Service Funding: Recruitment, Motivation, and Role Negotiation of Granting Committees. Journal of Health & Human Services Administration; 2020; 43(4): 420–444.
31. Van Wessel M, Naz F, Sahoo S. Complementarities in CSO Collaborations: How working with diversity produces advantages. VOLUNTAS: International Journal of Voluntary and Nonprofit Organizations; 2021; 32(4): 717–730.
32. Zhou Y, Gao S, Chen J. Motivations of R&D team participating in knowledge collaboration: A game analysis and empirical study. Journal of Interdisciplinary Mathematics; 2018; 21(4): 975–987.
33. Brunk-Chavez B, Pigg S, Moore J, Rosinski P, Grabill J. T. Designing, Building, and Connecting Networks to Support Distributed Collaborative Empirical Writing Research. Composition Studies; 2018; 46(1): 81–193.
34. David N, Brennecke J, Rank O. Extrinsic motivation as a determinant of knowledge exchange in sales teams: A social network approach. Human resource management; 2020; 59(4): 339–358.
35. Yildiz H. E, Murtic A, Zander U, Richtné A. What fosters individual-level absorptive capacity in MNCs? An extended motivation–ability–opportunity framework. Management International Review; 2019; 59(1): 93–129.
36. Wang X, Dolfsma W, Van der Bij H. Individual performance in a competitive R&D alliance: motivation, opportunity and ability. R&D Management; 2019; 49(5): 762–774.
37. Cady S. H, Brodke M, Parker N. When a Team is More Like a Group: Improving Individual Motivation by Managing Integrity Through Team Action Processes. Public Integrity; 2019; 21(1): 86–103.
38. Same A, McBride H, Liddelow C, Mullan B, Harris C. Motivations for volunteering time with older adults: A qualitative study. PloS one; 2020; 15(5). <https://doi.org/10.1371/journal.pone.0232718>
39. Romano C. Research strategies for small business: a case study. International Small Business Journal; 1989; 7(4): 3–43.
40. Kaltenbrunner K, Renzl B. Social capital in emerging collaboration between NPOs and volunteers: Performance effects and sustainability prospects in disaster relief. VOLUNTAS: International Journal of Voluntary and Nonprofit Organizations; 2019; 30(5): 976–990.
41. Perry C. Processes of a case study methodology for postgraduate research in marketing. Journal of Marketing; 1998; 32(9): 785–802.



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RE-FOOD: A Collaborative Movement Based on Volunteers Networking

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Abstract: Re-Food is a movement fuelled through community goodwill, which aims to reduce hunger by fighting food waste. Created from the work of a single person, Re-Food has grown to become a non-governmental organisation [NGO], with the status of Private Institution of Social Solidarity [PISS]. Through networking collaboration, Re-Food proposes to bring an equilibrium between demand and supply of food products. The Re-Food strategy is based on the redistribution of food received through donations. All donated food is distributed immediately, and there are no stocks to be managed. In a system of food redistribution surplus, a sustainable collaborative network with significant economic, social, and environmental impact should be considered. The sustainable collaborative network is formed by volunteers' work. The principal aim of this article is to investigate the Re-Food collaborative network. A qualitative methodology is followed, and the Chief Executive Officer (CEO) [R] and a coordinator of a Re-Food operations centre [C] were interviewed. Additionally, direct observations, and document analysis, support the investigation. The main result suggests a leadership model based on the acceptance of the different employees' capabilities and motivations, and that technology can increase the effectiveness and efficiency of networking, as well as improve communication between people.

Key terms: RE-FOOD, Motivation-Opportunity-Abilities, food loss & waste, collaborative network, volunteers

1. Introduction

The Global Harvest Initiative [GHI] has predicted that the world population will be around 9.8 billion people by 2050 [1]. However, 821 million people are estimated to suffer from food shortages [2]. Additionally, the loss and waste of edible parts of plants and animals that are not consumed amounts to as much as one-third of production. Reducing food loss and waste can be a way forward in combatting hunger [3]. In terms of impact, food waste can be considered as having an impact from production to disposal [3]. This impact is reflected negatively not only in terms of the economic level, but also on environmental and social levels. Moreover, the combination of factors associated with economic growth may lead to an increase in food waste and, consequently, have a strong negative impact on the environment [4].

Considering the existing global imbalance in food distribution, and its negative impact caused at different levels, the following question was raised: Is it possible to fight food waste and at the same time reduce hunger? Re-Food was created from the goodwill of its founder. The importance of the theme and attitude had such a strong impact on the spread among others that it resulted in a non-governmental (non-profit) institution. Re-Food is unique. It is different because it is a totally voluntary effort. The institution tries to help people who struggle, who want to eat, but do not have means to buy food. In addition to the lack of food, individuals suffer other problems, such as unemployment.

Aiming to investigate Re-Food's collaborative volunteering model of network, an exploratory research was developed. This study proposes a deeper understanding of a complex and understudied kind of organisation such as Re-Food, which depends entirely on voluntary work. This research developed two in-depth interviews, with the Chief Executive Officer (CEO) and with the coordinator of a Re-Food operations centre. The information acquired was cross-checked with the perspective of a coordinator of the institution's operations centre. This non-profit institution has a system for redistributing food surpluses, which mainly aims to reduce the hunger of people who cannot afford to buy food. This movement, powered by community goodwill, is mainly based on a collaborative approach towards redistribution, where all the food is given away daily, without being stocked.

This article shows a managerial perspective. It represents preliminary research. The main objective of this paper is to serve as a starting point for an extensive future research. The structure of the paper presents the Motivation-Opportunity-Abilities [MOA] model [5] to assess motivations and opportunities, and the formation of collaborative networks considering the food waste problem. Then, the methodology is defined, and the results obtained are presented. Finally, the final considerations are elaborated, with the respective limitations and practical implications.

2. Motivation-Opportunity-Abilities [MOA]

Over the years, food disposal practices were considered non-valued practices [6]. There is a need to recover, reduce, recycle, and reuse food [7]. In this regard, Ishangulyyev, Kim, and Lee [8] suggested facilitating the increased donation of unsold food in refectories and restaurants; implementing food safety campaigns and consumer education; reducing food portions; training about household saving; involving women in food safety campaigns; effective use of leftovers; training for managing restaurants, cafeterias, and supermarkets (ponder over demand); implementing good storage practices; interpreting expiry dates correctly; distributing excess food to groups with food shortages.

Conceptualised as food that spills, deteriorates, or declines in quality, such as developing blemishes in appearance, or food that is lost before consumption, food loss has been considered an unintended outcome, and wastage of food an outcome of a conscious decision [9]. Food can be discarded before cooking, in a raw or precooked state, or after cooking. However, food discarded in the manufacturing processes, distribution, and within the scope of services and sales, has been considered in the literature as food waste [10]. Therefore, it can be said that "food waste" still retains some quality or may be fit for consumption [9].

In order to investigate Re-Food's model of volunteering work, the conceptual framework that was considered suitable to be applied to volunteering work, namely volunteering related to food waste, was the conceptual model MOA, as it addresses associated determinants at the individual and societal level [5]. At the basis of the theory is the intention, which is cognitive, dependent on everyone, and indicates the individual's subjective probability of performing (or not performing) a certain behaviour; it is influenced by the expectation of the consequences of a particular behaviour [11].

Intention increases as there are favourable attitudes towards the behaviour, but also as a function of other individuals' perceptions of it. However, beliefs correspond to a subjective value judgment, concept, or attribute that an individual believes he or she has about themselves and the world around them, and they are supported according to the consequences of performing or not performing the behaviour [12]. Attitude is related to evaluation, and it depends on individual beliefs regarding consequences [13], and indicates an individual's predisposition to feel, think or act [14]. Perception of others, or normative beliefs, was defined by Fishbein and Ajzen in 1975 as the expectation or social pressure that affects perception. Approval by the group in which the individual is included can influence the individual's behaviour. The subjective norm can be defined as the perception of social pressure in relation to behaviour [13]. Beliefs might be tendentious, true, or false, accurate or inaccurate, rational or irrational, but the outcomes produced by attitudes, intentions and behaviours will be consistent with these individual's beliefs [15].

On the one hand, opportunities (conscious, explicit) were defined as a function of the preconditions for the behaviour. Additionally, the concept of capacity, which may favour using the "opportunities", was incorporated into the model. On the other hand, motivations were defined as cognitive factors (implicit, unconscious) [16]. Given that it has been used to assess food waste behaviour, and because it combines factors related to beliefs, individual, social, opportunities (conscious, explicit) and cognitive motivations (implicit, unconscious) [17], the MOA was considered the appropriate model for this research. However, since it considers that motivation is necessary for voluntary behaviour, such as waste reduction, the main object of study was the motivation for collaborative networking in terms of doing voluntary work. Furthermore, one might further state that the impact of this volunteer work is significant in the three dimensions: economic, social, and environmental.

3. Collaborative networks

Relationships develop commitments gradually [18-20]. And socio-psychological aspects were also considered significant by many authors such as [21-23]. The dynamic in personal relationships requires trust [24, 25]. In the field of social psychology, an important study of inter-organisational relationships has been developed [26, 27] as well as social exchange theory [28, 29]. Personal relationships use constructs considered to be the key elements in the network formation process, such as trust, friendship, commitment and the sharing of values and beliefs.

This study draws on volunteering work where the main motivation is to help the community [30]. Following the work developed by [30], to attract the best volunteer work, some recruitment methods should be included, such as open calls, word of mouth, and deliberate recruitment. Furthermore, complementary collaborative networks can facilitate capitalising on diversity [31]. Personal reputation, group identification, and sharing willingness have different effects on the motivations, and team motivation has a specific effect as a regulator on relationships [32]. Furthermore, flexibility is necessary in order to connect people, as is ongoing communication [33], and extrinsic motivation is a crucial factor for knowledge sharing within a network [34].

Intrinsic motivation has an influence on absorptive capacity in three dimensions: recognition, assimilation, and exploitation, and motivation should be a multidimensional construct [35]. The literature highlighted a positive interaction between position in the network and intrinsic motivation [36]. Aiming to achieve the best results, teams should be as homogeneous as possible [37]. The authors identified that the effort influences the intervention and indirectly, influences the individual performance.

Organisations should consider different workforce models, such as volunteering, for example, to support the most diverse initiatives [38]. Additionally, volunteers desired social connections, self-growth, recognition, and support. Emerging collaboration networks are invigorated through social capital [39]. Technology can increase the effectiveness and efficiency of networking, as well as improve communication between people. It is very important to consider that the introduction of technology, by using some logistic platforms and social media tools, for instance, can contribute towards strong and positive results. The advantages of the technological tools implemented can contribute not only to the development of strong relationships, but also to the forming of long-term relationships. This networking created based on strong relationships will improve the food donors, charities and volunteer work that will reflect in more food being distributed by people.

4. Materials and Methods

The conceptual framework of the study is based on the Motivation-Opportunity-Abilities framework. This model was chosen for several reasons. Firstly, because it addresses motivation. Considering there are no compensations, this variable is central in order to understand the reasons that lead to volunteer work. Secondly, because it presents the existing opportunities, and volunteer work can be reconciled with personal and professional lifestyles. Thirdly, because it requires important skills and competences for performing the work.

Re-Food model is inclusive and flexible enough. When an individual commitment overlaps voluntary work, working as a team main variables of this network. Besides, this model has already been tested on similar voluntary behaviour. Based on a volunteers' network, Re-Food is a successful movement founded on community goodwill. It is a non-profit institution with a system for redistributing surplus food. The organisation's mission is centred on reducing hunger, and the collaborative redistribution strategy, where all food is redistributed daily, without holding any stock. The principal objective was to understand the success of this voluntary network and how it can be replicated in other important and relevant contexts. So, this study tried to understand the model and the leaders.

Aiming to investigate Re-Food's collaborative volunteering model, the Chief Executive Officer (CEO) was interviewed. The information acquired was cross-checked with the perspective of an operation's centre coordinator of the charity. Interviews

were conducted with two individuals: i) one is connected to an operational centre for the distribution of food (daily surplus) to people with this type of need (to demand it), and ii) the other one is the organisation's founder and CEO.

There is no consensus among authors regarding the ideal number of interviews [40]. For this specific case and following [41] who defends the minimum of two interviews, this research opted for two in-depth interviews, with the Chief Executive Officer (CEO) and with the coordinator of a Re-Food operations centre. The interviews were recorded, and the content was transcribed. Relevant factors of Re-Food model were identified, which allows the authors to adapt this model for other important and relevant contexts.

The interviews comprised open and semi-structured questions; based on the variables, the guide was developed. The interviews were recorded, transcribed, and analysed according to the following variables: i) beliefs, individual and social; ii) opportunities; iii) motivations; iv) factors favouring the development of networks. Different sources of information were added to support the research, such as some direct observations, as well as some different documents. The interviews were analysed, and the information obtained was used to determine how the relevant variables intersect. The collaborative network, based on voluntary work, can be considered sustainable over time since it does not need many resources and uses surpluses instead.

5. Results

The exploration of factors was focused on the dimensions of the variables. The beliefs, individual and social, opportunities, motivations, and factors that favour the formation of networks.

5.1. Beliefs

The main belief identified in this research was the myth of similarity between volunteering and paid work. At Re-Food, voluntary work requires responsibility, but Re-Food's business model assumes that there is more than one person doing the same tasks, allowing for immediate replacement, even in unexpected cases. So, for Re-Food's CEO, there are two models of voluntary work: the classic and the Re-Food model: "... volunteers have to be super responsible... they have to treat it as a job! So, that is the classic theory... [R] has a different theory ... which is that everybody is different, and everybody is valuable! We are going to have five stars volunteers: volunteers with good will, who have enthusiasm, and availability, and responsibility and competences. There are volunteers like that, and we are very happy to have them, but there are other volunteers who have four of those qualities. Others have three, others who have two, others who only have one. And at Re-Food, all of them are considered valuable... we have an open model. People are welcome!"

Although the model is flexible, smaller operational nuclei have added difficulty. For [C], "... volunteering at Re-Food is open! When I say open, I mean that you don't need any special qualifications or special technical skills to do it. Obviously, there are characteristics that we look for and that we try to encourage... in those who come to join us as volunteers, but they are characteristics that are common, that result from goodwill, good manners, love of neighbour... anyone can volunteer!"

For Re-Food's CEO, you have to know people because, for example, if Africans are offered a soup, for cultural reasons, soup is not part of their feeding habit and so these individuals do not feel they are being fed: "... and then, we receive those people, we interview them, we get to know them, ... knowing what they can't eat or they won't eat... people from Africa, very often, they don't eat soup because soup is not part of their culture. So, if you give them soup, you are not feeding them ... it's better to know and give them food that they are going to eat".

5.2. Opportunities

Regarding opportunities, it is crucial to involve the whole community to explore the opportunities in relation to the food surplus, and at the same time, identify people who have food shortage. Furthermore, all the work is based on volunteering and goodwill, and therefore it is necessary to involve the community so that everyone collaborates, in an open and flexible way. According to [C], "... it is a process that involves the community in its total dimensions... that dynamises social interrelationships, deepening bonds of solidarity... that transforms this waste... to the benefit of those who need it".

5.2.1. Opportunities were reported on the supply and demand side of food

On the supply side, it becomes essential to identify excess food that is fit for people's consumption. According to the CEO of Re-Food: "every business... has a daily cycle... so, you have these two moments in the business cycle of every food producer, which is when the food loses its commercial value, and then, at a later point, it loses its nutritional value... we work between those two moments... that is our window of opportunity". There are different formats for identifying partners, and it is possible to invite them directly or indirectly, formally or informally. According to the interviewee [C]: "...an invitation to business organizations... that all their daily food surplus... ...that these organizations would be willing to make available to the nucleus..."

Occasionally, events are organised to present the work developed by Re-Food, and in this way involve companies, individuals, and the whole community. [C] explained that: "...we invite... directly, through events, bringing together partners... companies linked to the restaurant business and similar, large distribution companies, supermarkets, hypermarkets, small and local grocery stores... and we make an invitation through either personal contact via volunteers, or contact is, let's say, more formal, through an invitation by email or by letter..."

On the demand side, the need can be identified through the volunteers' contact network or through a request for help from the individual. It is also possible to identify needs from other charities. [C] argued: "...meet people, through their social circle of friends... people who are in trouble... it is the nucleus itself that approaches people, in the sense of understanding whether these people will be interested in receiving our help... There is the individual form of self-help... people, knowing of the existence of the nucleus, then come to us... There is also the referral, through other social solidarity institutions... they also work in this social market... fourth sector, as it is now called".

5.3. Motivations

The opportunities will not be significant if people are not motivated to work, especially if it is voluntary work. However, to be stimulated, voluntary work cannot represent social pressure. On the contrary, in the Re-Food model, this type of work

enables each volunteer's personal and professional life to be reconciled. For [C], "... the Re-Food project is an inclusive project. It means that all its activity starts with an invitation, an invitation to everyone!". Considering that contingencies happen, Re-Food's business model has been supersized to be flexible. According to Re-Food's CEO: "when somebody misses, when they come back next week, we don't say... "oh, you screwed everything up" ... we just say: hey, we are glad you are here. Let's go!".

5.3.1. Factors favouring the formation of networks

The first factor identified as favouring the formation of networks was the adoption of an inclusive model. Flexibility is a keyword. And accepting differences seems to have been an appropriate decision. The [C] advocated that "Everyone is welcome!" And the Re-Food CEO included other institutions at the local level, arguing that these institutions know people in need of food: "...a lot of institutions can work local knowing the family who needs support". To promote the formation of networks, the second factor identified was to create a model capable of being replicated. For [C], "... this project... already has a cross-border dimension and, therefore, it already has an international dimension, and there are already nuclei... operating in Spain, Italy and also in Latin America..."

Feeding individuals who are in a time of food shortage is very important. It is part of Re-Food's mission. And it needs to be done in the short term. However, in the long term, medium and long-term alternatives need to be identified. Having proactive and open-minded people capable to be innovative enables the business model to solve the cause of the problem and restore the dignity of individuals. In this sense, the third very important factor in the formation of networks was identified: volunteers and their skills. According to [C], "... we even have some accompaniment technicians, because we also assess the possibility of, how can we, beyond food, how can we help those people to get out of that situation". The principal result is achieved: a network based on a model in voluntary work, organised by a flexible leadership model, which accepts the different capacities of the employees, and integrates them into the institution. The role of everyone in this network can be defined according to their different motivations.

6. Conclusions

Re-food is dealing with people with different basic needs, namely food, and also economic and social needs. The authors decided not to interview these people due to the sensitivity that this subject provokes. The methodology could be improved if these people were also surveyed. However, this topic is very delicate, sensitive enough to be avoided. Furthermore, leadership was considered the most important factor in understanding Re-Food's inclusive model.

The present work contributes to the food waste collaborative volunteering network in several ways. Comparing Re-Food with other institutions is a difficult task. Re-Food is an organisation literally based on voluntary network, and based on assumptions such as teamwork, inclusion, and flexibility. The result of this model allows both people and organisations to become increasingly involved.

Food waste prevention is the best option. Avoiding food waste produces the best results in terms of socio-economic and environmental impact. Food bank activities and food sharing practices were classified as reuse. Recycling or recovery includes animal feed and composting, and it was also considered among valuable recommended practices, or recovery practices that add value to the food waste prevention. Considering Re-Food's collaborative volunteering model as a success case, in order to explore the main factors associated with the Re-Food Movement, qualitative research was carried out. With the aim of presenting the best practices in the fight against food waste, direct observations and in-depth interviews were conducted to explore the activities already implemented in Portugal. The Chief Executive Officer (CEO) and a coordinator of an institution's operations centre were interviewed. It is possible to learn from the best practices, mainly when they are associated with a relevant topic such as the fight against food waste. Thus, there are two major advantages of this organisation: it has no stock, and it is based on voluntary work.

Furthermore, considering the need and the importance of reducing hunger among people suffering from food shortages, Re-Food is a non-profit institution whose model is mostly based on a collaborative strategy that integrates supply and demand. Surplus and donated food are redistributed daily, without being stored. There is no stock. And all the work of donation, organisation, and redistribution is based on volunteering work. Re-Food's system of redistributing food surplus is totally based on volunteer basis. This research may not be very extensive, but it was developed with the necessary rigor that allows readers to learn from a successful practical case study.

Among the findings, we highlight: (i) the myth of the similarity between volunteer work and paid work; (ii) Re-Food's model, which is inclusive, open, and flexible; (iii) its opportunities on the food supply side, which seeks to identify surplus quantities of food in a condition to be consumed by people; and (iv) the several opportunities highlighted on the food demand side, with multiple ways of recognising different needs, and the reconciliation of each volunteer's personal and professional life, as it provides various motivations for making the commitment to volunteer work. This research allows us to deliver the following recommendations: First, to be inclusive, voluntary work cannot be a painful obligation. Second, through simple solutions and a lot of balance, it is possible to feed all people, and help them overcome difficult moments. Third, networks have presented themselves as an excellent way to connect complementary people. Sharing knowledge allows us to optimise results from available resources, that are characterised as important but scarce.

Finally, considering that this movement is nourished by the goodwill of everyone, and considering that it does not require many resources and uses food surpluses, this network, based on voluntary work, could be considered a sustainable model over time. Furthermore, the impact of the network, which reduces negative outcomes in all three dimensions of sustainability – social, economic, and environmental – should be considered significant.

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References

1. Global Harvest Initiative [GHI] (2018). Agriculture for a Healthy Sustainable World, 2018 Global Agricultural Productivity Report® (GAP Report®), ed. Ann Steensland & Margaret Zeigler, GHI Washington, D.C. Retrieved from https://globalagriculturalproductivity.org/wp-content/uploads/2019/01/GHI_2018-GAPReport_FINAL-10.03.pdf.
2. FAO, IFAD, UNICEF, WFP and WHO (2018). The State of Food Security and Nutrition in the World 2018. Building climate resilience for food security and nutrition. Rome, FAO. ISBN 978-92-5-130571. Retrieved from <http://www.fao.org/3/I9553EN/i9553en.pdf>.
3. Kitinoja, L. (2016). Innovative Approaches to Food Loss and Waste Issues, Frontier Issues Brief submitted to the Brookings Institution's Ending Rural Hunger project. <https://www.endingruralhunger.org/>.
4. De Laurentiis, V, Hunt, D & Rogers, C (2016). Overcoming Food Security Challenges within an Energy/Water/Food Nexus (EWFN) Approach, Sustainability, 8, (1), 95. Retrieved from <https://doi.org/10.3390/su8010095>.
5. Ölander, F. & J. Thøgersen, (1995). Understanding Consumer Behaviour as Prerequisite for Environmental Protection. Journal of Consumer Policy 18, 345-385. Retrieved from <https://doi.org/10.1007/BF01024160>.
6. Imbert, E. (2017). Food waste valorization options: opportunities from the bioeconomy. Open Agriculture; 2(1): 195-204 DOI 10.1515/opag-2017-0020.
7. David, A.; Thangavel, Y. D. & Sankriti, R. (2019). Recover, Recycle and Reuse: An Efficient Way to Reduce the Waste. International Journal of Mechanical and Production. Engineering Research and Development (IJMPERD), 9(3), 31-42. ISSN(P): 2249-6890; ISSN(E): 2249-8001.
8. Ishangulyyev, R.; Kim, S. e Lee, S. H. (2019). Understanding Food Loss and Waste—Why Are We Losing and Wasting Food? Foods, 8, p. 297. Doi:10.3390/foods8080297.
9. Lipinski, B., Hanson, C., Lomax, J., Kitinoja, L., Waite, R., & Searchinger, T. (2013). Reducing food loss and waste. World Resources Institute Working Paper, 1-40. Retrieved from https://wriorg.s3.amazonaws.com/s3fs-public/reducing_food_loss_and_waste.pdf.
10. Mena, C., Adenso-Díaz, B. & Yurt, O. 2011. The causes of food waste in the supplier-retailer interface: Evidences from the UK and Spain. Resources, Conservation and Recycling 55(6): 648-658. Retrieved from http://analyseplatformen.dk/Data/madspildsmonitor/HTML_madspildsplatform/assets/menat-al_2011_the-causes-of-food-waste-in-the-supplier-retailer-interface_evidences-from-theuk-and-spain.pdf.
11. Fishbein M. & Ajzen I. (1975), Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research, Menlo Park, California: Addison-Wesley Publishing Company, ISBN 0201020890, (Retrieved from <http://www.people.umass.edu/ajzen/fea1975.html>, 21/12/2010).
12. Zawawi, S. N. H. M., Jusoff, K., Rahman, R. A. & Idris, K. M. (2008). Behavioural Intention for Fraudulent Reporting Behaviour Using Cognitive Theory, Asian Social Science, 4(7). (Retrieved from <http://www.ccsenet.org/journal/index.php/ass/article/view/1369/1332>, 22/12/2010).
13. Fraser, R. T.; Johnson, K.; Hebert, J.; Ajzen, I.; Copeland, J.; Brown, P. & Chan, F. (2010). Understanding employers' hiring intentions in relation to qualified workers with disabilities: preliminary findings, Journal of occupational rehabilitation, 20(4), pp. 420-6. doi:10.1007/s10926-009-9220-1.
14. Aleassa, H.; Pearson, J. M. & McClurg, S. (2010). Investigating Software Piracy in Jordan: An Extension of the Theory of Reasoned Action, Journal of Business Ethics, 98(4), pp. 663-676. doi:10.1007/s10551-010-0645-4.
15. Geraerts, E., Bernstein, D. M., Merckelbach, H., Linders, C., Raymaekers, L., & Loftus, E. F. (2008). Lasting false beliefs and their behavioral consequences. Psychological Science, 19(8), 749-753.
16. Egmond, C., & Bruel, R. (2007). Nothing is as practical as a good theory. Analysis of theories and a tool for developing interventions to influence energy-related behaviour.
17. Van Geffen, E. J., van Herpen, H. W. I., & van Trijp, J. C. M. (2017). Quantified consumer insights on food waste: Pan-European research for quantified consumer food waste understanding: D1.4. REFRESH. Retrieved from https://eurefresh.org/sites/default/files/REFRESH%202017%20Quantified%20consumer%20insights%20on%20food%20waste%20D1.4_0.pdf.
18. Andersson, R.G. (1979). The Birth Process of a New Organization: The Case of a Joint Venture, paper of Växjö University College, Suécia.
19. Morgan, R.M. & Hunt, S.D. (1994). The Commitment-Trust Theory of Relationship Marketing, Journal of Marketing, 58, July, pp. 20-38.
20. Holm, D. B.; Eriksson, K. & Johanson, J. (1996). Business Networks and Cooperation in International Business Relationships, Journal of International Business Studies, Special Issue, pp. 1033-1053.
21. Cook, K.S. e Emerson, R.M. (1978). Power, Equity and Commitment in Exchange Networks, American Sociological Review, 43, October, pp. 721-739
22. Woolthuis, R. K. (1996). Entrepreneurial Activity Through Inter-organizational Relationships – A Longitudinal Approach to IOR Development, paper presented at RENT X, November, Brussels.
23. Varamäki, E. & Pihkala T. (1997). A Hotel of Small Firms – An Oddity of SME-Networking, proceedings do International Council for Small Business, 42nd World Conference in Entrepreneurship the Engine of Global Economic Development, June, San Francisco.
24. Nooteboom, B. (1996). Trust, Opportunism and Governance: A Process and Control Model, Organization Studies, 17(6), pp. 985-1010.
25. Hirschman, A.O. (1984). Against Parsimony: Three Easy Ways of Complicating Some Categories of Economic Discourse, American Economic Review, 74 (2), pp. 88-96.
26. Johannisson, B. (1987). Beyond Process and Structure: Social Exchange Networks, International Studies of Management and Organisation, 17(1), pp. 3-23.
27. Johannisson, B. (1990). Economies of Overview-Guiding the External Growth of Small Firms, International Small Business Journal, 9(1), pp. 32-44.
28. Blau, P. (1968). The Hierarchy of Authority in Organizations, American Journal of Sociology, 73 (4), pp. 453-467.
29. Wayne, S. J.; Shore, L. M. & Linden, R. C. (1997). Perceived Organizational Support and Leader-Member Exchange: A Social Exchange Perspective, Academy of Management Journal, 40(1), pp. 82-111.
30. Farwell, M. M., & Handy, F. (2020). Putting the Community in Community-Based Human Service Funding: Recruitment, Motivation, and Role Negotiation of Granting Committees. Journal of Health & Human Services Administration, 43(4), pp. 420-444.
31. Van Wessel, M., Naz, F., & Sahoo, S. (2021). Complementarities in CSO Collaborations: How working with diversity produces advantages. VOLUNTAS: International Journal of Voluntary and Nonprofit Organizations, 32(4), 717-730.
32. Zhou, Y., Gao, S., & Chen, J. (2018). Motivations of R&D team participating in knowledge collaboration: A game analysis and empirical study. Journal of Interdisciplinary Mathematics, 21(4), 975-987.
33. Brunk-Chavez, B., Pigg, S., Moore, J., Rosinski, P., & Grabill, J. T. (2018). Designing, Building, and Connecting Networks to Support Distributed Collaborative Empirical Writing Research. Composition Studies, 46(1), 81-193.
34. David, N., Brennecke, J., & Rank, O. (2020). Extrinsic motivation as a determinant of knowledge exchange in sales teams: A social network approach. Human resource management, 59(4), 339-358
35. Yildiz, H. E., Murtic, A., Zander, U., & Richtnér, A. (2019). What fosters individual-level absorptive capacity in MNCs? An extended motivation-ability-opportunity framework. Management International Review, 59(1), 93-129.
36. Wang, X., Dolfma, W., & Van der Bij, H. (2019). Individual performance in a competitive R&D alliance: motivation, opportunity and ability. R&D Management, 49(5), 762-774.
37. Cady, S. H., Brodke, M., & Parker, N. (2019). When a Team is More Like a Group: Improving Individual Motivation by Managing Integrity Through Team Action Processes. Public Integrity, 21(1), 86-103.
38. Same, A., McBride, H., Liddelow, C., Mullan, B., & Harris, C. (2020). Motivations for volunteering time with older adults: A qualitative study. PloS one, 15(5), e0232718.
39. Romano, C. (1989). Research strategies for small business: a case study. International Small Business Journal, 7(4), 3-43.
40. Kaltenbrunner, K., & Renzl, B. (2019). Social capital in emerging collaboration between NPOs and volunteers: Performance effects and sustainability prospects in disaster relief. VOLUNTAS: International Journal of Voluntary and Nonprofit Organizations, 30(5), 976-990.
41. Perry, C. (1998). Processes of a case study methodology for postgraduate research in marketing. Journal of Marketing, 32(9), 785-802



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„Nove perspektive virtuelne i proširene stvarnosti: pronalaženje novih nastavnih pristupa u transformisanom okruženju za učenje“, uredila Linda Danijela, Rautlidž, 2020, prikaz knjige

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Apstrakt: Knjiga „Nove perspektive virtuelne i proširene stvarnosti: pronalaženje novih nastavnih pristupa u transformisanom okruženju za učenje“ može se koristiti u inovativnoj pedagogiji. Postoji neodložna potreba da se objasni i podrži učenje u transformisanom obrazovnom okruženju. Tehnološki napredak je omogućio nove načine učenja, ali i kreirao nove probleme za obrazovne institucije. Rešenja u vezi sa virtuelnom realnošću su uzbudljiva, ocharavajuća i pristupačna i mogu da ubrzaju obrazovni proces. Kao obrazovni resurs, ova knjiga proučava potencijal virtuelne, proširene i mešovite stvarnosti (VR/AR) da edukatorima pomažu da unaprede učenje, ali i načine na koje se ove tehnologije mogu primeniti u učionici. Kao alat za izgradnju znanja i razvoj metakognitivnih procesa, rešenja u vezi sa virtuelnom stvarnošću mogu da budu efektivni obrazovni alati koji proširuju obim obrazovnih mogućnosti za učenike iz svih slojeva. Ova knjiga je neprocenjiva za akademike, istraživače i postdiplomske studente koji studiraju obrazovne tehnologije.

Glavne reči: virtuelna stvarnost, mešovita stvarnost, proširena stvarnost, okruženje za učenje, obrazovna tehnologija.

1. Uvod

Tehnološki napredak i mogućnosti digitalizacije transformišu obrazovno okruženje na različite načine, zbog čega je neophodno osigurati usvajanje osnovnih kompetencija bez kojih je nemoguće funkcionisati u današnjem svetu i postarati se da opsesivnost tehnologijom ne nadvlada ciljeve učenja. Istraživači u ovoj knjizi ispituju mogućnosti virtuelne, proširene i mešovite stvarnosti predlažući načine za poboljšanje učenja, primenjujući postojeća VR/AR rešenja kao alate za učenje i strukturiranjem procesa učenja. VR/AR rešenja mogu da nam pomognu da naučimo stvari koje bismo inače teško ili nikako mogli da razumemo. Nekoliko je razloga zašto se VR rešenja mogu tako uspešno primenjivati u obrazovanju: ona umanjuju prepreke i pružaju pristup teško dostupnim mestima, bilo zbog istorijskih promena i napretka ili zbog neophodnosti da se istorijske i prirodne vrednosti sačuvaju od ljudskog uticaja; pomažu nam da apstraktno učenje pretvorimo u konkretno jer omogućavaju savladavanje složenih pojmova i, konačno, osiguravaju inkluzivno obrazovanje. Ove mogućnosti mogu i treba da se koriste za poboljšanje razumevanja. Pošto su VR/AR rešenja povezana sa problemima u obrazovanju koji nastaju usled nedovoljnog postignuća, istraživači trenutno istražuju različite načine za primenu VR/AR rešenja u obrazovanju sa ciljem da se obrazovni proces učini efikasnijim, modernijim i raznovrsnijim. Pored toga, oni traže i tehnička rešenja da virtuelnu realnost učine pristupačnijom i privlačnijom.

2. Struktura knjige

Knjiga „Nove perspektive virtuelne i proširene stvarnosti: pronalaženje novih nastavnih pristupa u transformisanom okruženju za učenje“ sastoji se iz tri dela. Prvi deo, „Virtuelna stvarnost u humanističkim i društvenim naukama“, sadrži sedam poglavlja. Drugi deo, „Pojmovi u virtuelnoj stvarnosti“, sadrži pet poglavlja, i treći deo, „Virtuelna stvarnost u prirodnim naukama i medicinskom obrazovanju“, sadrži pet poglavlja. Knjiga ima 322 strane i sadrži 67 crno-belih ilustracija [1].

Prvo poglavlje, pod naslovom „Alat za evaluaciju iskustava učenja u virtuelnoj stvarnosti za dizajnere nastave i edukatore“, govori o tome da je razvoj virtuelnih okruženja za učenje i iskustava virtuelnog učenja dizajnerima nastave i edukatorima omogućio da se fokusiraju na kontekst i pozadinu učenja umesto isključivo na materijal. Postoji mnoštvo studija o tehnološkim rešenjima u vezi sa virtuelnom stvarnošću u njihovim nedostacima. Međutim, edukatorima i dizajnerima nastave je i dalje teško da pronađu smernice za kreiranje virtuelnih iskustava učenja koja će neizostavno dovesti do ispunjavanja ciljeva učenja. Zbog toga se čini da aktuelna istraživanja virtuelne stvarnosti imaju poteškoća da razumeju osnovne principe ovog procesa i na koji način su povezani sa postojećim teorijama učenja, nastavnim praksom i nastavnim planom i programom. Sa brzim razvojem virtuelnog učenja, neophodno je sistematizovati pedagoške koncepte pomoću kojih se upravlja virtuelnim učenjem i pruža mu se podrška. Ovo poglavlje predstavlja alat za evaluaciju virtuelnih iskustava učenja i podvlači ključne aspekte na koje predavači i edukatori treba da obrate pažnju prilikom dizajniranja i implementacije iskustava učenja zasnovanih na virtuelnoj stvarnosti [2]. Grafika visoke rezolucije i imerzivni sadržaj dostupan pomoću naočara / vizira za virtuelnu stvarnost (HMD – head-mounted display) omogućavaju učenicima da istražuju složene teme i koncepte na način koji je nemoguć kod tradicionalnih obrazovnih metoda [3–4].

Drugo poglavlje, pod naslovom „Obrazovna perspektiva doživljaja kulturne baštine ostvarenih pomoću virtuelne stvarnosti“,

govori o tome kako je čovečanstvo oduvek zamišljalo virtuelnu stvarnost. U početku je virtuelna stvarnost bila isključivo povezana sa poljem IKT-a, ali kasnije su se i vojna i zdravstvena industrija zainteresovale za njene potencijale. Danas je VR već prisutan i na polju obrazovanja, gde omogućava nove metode učenja, mogućnosti i ishode. Virtuelna stvarnost može da preobrazuje obrazovanje, jer tehnologija učenicima omogućava da iskuse stvari koje su nedostižne ili nemoguće u stvarnom svetu. VR nudi širok spektar mogućnosti, ali ne treba zaboraviti da se obrazovni ciljevi moraju postići. Iako je tačno da VR može da poboljša učenje, neophodno je osigurati da se znanje ne izgubi u pomami za virtuelnom stvarnošću. Ovo poglavlje istražuje obrazovni potencijal virtuelnih iskustava i predstavlja alat za evaluaciju koji se koristi za procenu virtuelnih doživljaja kulturne baštine.

Treće poglavlje, „Potencijali virtuelne stvarnosti u preduzetničkom obrazovanju“, analizira savremeno preduzetništvo koje ohrabruje ljude da upotrebe svoje veštine i sposobnosti kako bi kreirali nove proizvode za kojima postoji potreba na tržištu. Međutim, pokretanje sopstvene kompanije je neizvestan i nestabilan proces koji zahteva razvijen mentalni model za razumevanje situacije i donošenje odluka. Preduzetničko obrazovanje osposobljava ljude tako što im obezbeđuje informacije i sposobnosti koje su im neophodne da bi prepoznali relevantne prilike i rizike, ali mana mu je to što mu često nedostaju praktični nastavni alati. Prema tome, proučavanje virtuelne stvarnosti kao tehnološkog i dopunskog alata koji korisnicima omogućava da uče i razvijaju sposobnosti uaranjem u virtuelne svetove predstavlja presudan prvi korak [2].

Četvrto poglavlje, pod nazivom „Primenjeno pozorište mešovite stvarnosti na univerzitetu“, govori o obrazovnom konceptu mešovite stvarnosti na primeru primenjene pozorišne nastave na univerzitetskom nivou. Kod primenjenog pozorišta pojedinci sarađuju kako bi unapredili zajednički komšiluk. Plan lekcije je razvijen pomoću „Teatra potlačenih“ Augusta Boala (Augusto Boal) i obrazaca za dizajn MR interfejsa. Dramaturška pedagogija zasnovana na mogućnostima mešovite stvarnosti i Boalovog metoda omogućava nove načine razmišljanja o društvenim izazovima. Plan lekcije je razvijen na Tehnološkom institutu Džordžija za potrebe rešavanja bezbednosnih problema na kampusu. Učesnici radionice su verovali da su stekli jedinstveno znanje o bezbednosti pomoću mešovite stvarnosti i konstruktivističkih vežbi. Studenti su takođe smatrali da bi njihov rad mogao biti koristan za univerzitetski kampus. Osim plana časova, edukatori koji žele da inkorporiraju mešovitu stvarnost u svoje nastavne prakse u vezi sa primenjenim pozorištem otkriće da ova tehnologija pruža mnoštvo drugih mogućnosti. Plan lekcije je razvijen pomoću „Teatra potlačenih“ Augusta Boala i obrazaca za dizajn MR interfejsa. Istraživači iz sveta pozorišta i akademske zajednice bi trebalo da postave sledeće pitanje: Sta je mešovita stvarnost i zašto je značajna za pozorište? Kakva je scenografija okruženja postignutog pomoću mešovite stvarnosti? Koja je uloga tehnologije mešovite stvarnosti kao sastavnog dela procesa iskustvenog umetničkog dizajna u obrazovanju?

Peto poglavlje, „Razvoj profesionalnih veština u visokom obrazovanju: problemsko učenje pomoću imerzivnih svetova“, podstiče usvajanje profesionalnih veština u vezi sa rešavanjem problema iz stvarnog sveta pomoću aktivnih pristupa nastavi. Razvoj ovih kompetencija kod pojedinaca koji žele da uspeju u društvu znanja predstavlja proces za koji postoji višestruko interesovanje. Ovo poglavlje prikazuje projekat za izgradnju inženjerskih i matematičkih profesionalnih kompetencija pomoću okruženja koja se generišu u imerzivnim svetovima. Stavlja se naglasak na interakciju sa profesionalcima iz različitih oblasti. Stvoreno je nekoliko scenarija za javne ugovore, tehničku podršku i dizajniranje nastavnog programa. Ove scenarije su kreirali stručnjaci iz industrije (kreatori politika, vlasnici itd.) i ugradili ih u okruženje imerzivnog sveta. Kao rezultat, studenti su stupali u međusobne interakcije kao različite zainteresovane strane u procesu, radili na odgovarajućoj dokumentaciji i procenjivali sopstvene profesionalne uloge. Iskustvo ocenjivano na osnovu mišljenja studenata o sopstvenim profesionalnim zadacima. Ovo iskustvo učenja povećalo je profesionalno samopouzdanje učesnika. Imerzivni svetovi mogu da generišu obrazovne predloge koji unapređuju učešće studenata i razvoj veština [2].

Šesto poglavlje, „Virtuelna i proširena stvarnost u obrazovnim programima“, govori o tome kako ove tehnologije postoje već godinama i kako se mogu koristiti i na pametnim telefonima, ajpedima i kompjuterima. Virtuelna i proširena stvarnost mogu se koristiti na različitim nivoima obrazovanja. Ovo poglavlje predstavlja primenu proširene i virtuelne stvarnosti u obrazovanju i opisuje njihovu primenu u okviru obrazovnih programa u vezi sa medicinom, sportom, istorijom i vojskom.

Sedmo poglavlje, „Istraživanje uticaja proširene i virtuelne stvarnosti u okviru obaveznog obrazovanja“, istražuje primenu virtuelne i proširene stvarnosti u Velikoj Britaniji, na uzrastu od 5 do 18 godina. Poglavlje takođe prikazuje aktuelna istraživanja o njihovoj upotrebi u osnovnoj školi, u okviru navedene starosne grupe, sa ciljem procene uticaja proširene i virtuelne stvarnosti na nastavni program [2].

Drugi deo, „Pojmovi u virtuelnoj stvarnosti“, sadrži pet poglavlja [2]. Osmo poglavlje, „Transcedentni prostori za učenje“, govori o tome kako nove tehnologije, poput proširene i virtuelne stvarnosti, mogu da se upotrebe za modelovanje stvarnih situacija u digitalnom svetu. Sve dok su postavljene na zdravim pedagoškim osnovama, one mogu da pruže moćna obrazovna iskustva koja prevazilaze tradicionalnu nastavu. Kako bismo to postigli, neophodno je da bolje razumemo način na koji ljudski mozak obrađuje ove simulacije i proširenja stvarnosti. Pojam transcedencije je od suštinskog značaja za razumevanje njihove vrednosti. Prostori za učenje u okviru proširene i virtuelne stvarnosti učenicima pružaju emocionalnu podršku i stimulaciju u transmedijskom okruženju. Oni mogu biti veoma efikasni za različite populacije učenika, uključujući one koji su u najvećoj opasnosti od isključivanja i odbacivanja tokom obrazovnih kriza.

Deveto poglavlje, pod nazivom „Jačanje poverenja u sisteme virtuelne stvarnosti“, govori o tome kako je tehnologija virtuelne stvarnosti stekla veliku popularnost poslednjih godina, kako u poslovnom svetu tako i svetu zabave. VR sistemi se sve više koriste u zdravstvu, obrazovanju i obuci. VR ima nedvosmislene obrazovne prednosti nad drugim tehnologijama, zbog čega njegova primena u nastavi i učenju raste. Međutim, da bi bilo koja tehnologija bila delotvorna i da bi se primenjivala, neophodno je poverenje korisnika. Različite studije pokazuju da nepouzdati sistemi za e-učenje mogu da budu neefikasni, pa čak i da povećaju stopu napuštanja školovanja. Ovo poglavlje opisuje studiju osmišljenu da testira uticaj upotrebljivosti, prihvatanja tehnologije i prisustva na poverenje u VR model. Rezultati pomažu u proverbi valjanosti modela, što bi moglo da dovede do unapređenja dizajna VR tehnologije kako bi se povećalo poverenje korisnika, poboljšala interakcija između korisnika i sistema, ali i efektivnost tehnologije kada dostigne svoj pun razvoj [2].

Deseto poglavlje nosi naziv „Vizuelizacije simulacionih podataka u mešovitoj stvarnosti pomoću Microsoft HoloLens TM-a“. Simulacije i testne ploče su kompleksna tema za studente mašinstva i novozaposlene. HoloLens se koristi za vizuelizaciju CAD modela, podataka sa senzora i simulacije podataka dobijenih tokom probnog rada testne ploče ventilacionog sistema. Teško je uočiti promene temperature i pritiska na neprozirnim delovima poput cevčica, kompresora, kondenzatora i električnih ekspanzionih ventila. Aplikacija HoloLens podržava virtuelnu stvarnost i CAD. Na primer, korišćene su MR ispune (overleji) za kolorizaciju promena temperature i pritiska na testnim pločama. Aplikacija HoloLens je dizajnirana tako da smanji vreme i trud koji su potrebni za razumevanje simulacija i testnih ploča. Aplikacija se takođe može koristiti za razmenu znanja i iskustava između različitih departmana [2].

Jedanaesto poglavlje, pod nazivom „A+Ha!: kombinovanje taktilne interakcije sa proširenom stvarnošću za transformaciju sekundarnog i tercijarnog STEM obrazovanja“, tvrdi da korišćenje novih tehnologija koje kombinuju haptičku interakciju sa strateški proširenom digitalnom stvarnošću radi promocije bržeg i efikasnijeg usvajanja predmetne intuicije (npr. strukturna mehanika) može značajno unaprediti delotvornost, pristupačnost i zastupljenost STEM nastave i učenja u sekundarnom i tercijarnom obrazovanju [2].

Dvanaesto poglavlje, „Primena rasplinutih ugaonih modela i 3D modela za procenu metoda izgradnje Kineskog zida u Đinšanlingu kao studije slučaja istorije građevinarstva u obrazovanju“, predstavlja tri moguća građevinska metoda koja su korišćena za izgradnju zida i kula na delu Kineskog zida poznatom kao Đinšanling, tokom vladavine dinastije Ming. Nedostatak podataka o drevnim metodama gradnje u ovom regionu zahteva subjektivni pristup pomoću tehnike rasplinite modus ponens dedukcije. Odabrani su i korišćeni rasplinuti ugaoni modeli kako bi se odredile najverovatnije i najodrživije građevinske metode i redosled gradnje. Faktori koji su uticali na odabir metoda uključuju dostupnost radne snage, materijale i opremu, stanje tla, postojeće strukture, kao i pristupačnost gradilišta i mesta za skladištenje materijala. Iako svaki model ima svoje prednosti i mane, tehnika dedukcije modus ponens, koja koristi rasplinite ugaone modele, sugerise da je prva metoda koja se vezuje za simultanu izgradnju zida i kula spolja i iznutra, ima najveću verovatnoću, te stoga najverovatnije predstavlja tehniku koju su drevni kineski graditelji primenili u ovom slučaju. Ista metodologija se može primeniti i za rekreiranje redosleda izgradnje drugih drevnih građevina na inženjerskim predmetima. Rezultati se mogu prikazati pomoću virtuelne stvarnosti, sa ili bez korišćenja rasplinite logike, koja je pogodna za primenu kako u osnovnoj, tako i u srednjoj školi i visokom obrazovanju [2].

Treći deo, „Virtuelna stvarnost u prirodnim naukama i medicinskom obrazovanju“, sadrži pet poglavlja. Trinaesto poglavlje, „Primena virtuelne stvarnosti u medicinskom obrazovanju, tj. usvajanju kliničkih veština“, govori o tome kako je virtuelna stvarnost postala legitiman nastavni metod u usvajanju kliničkih veština za studente medicine, zbog tehnološkog napretka i smanjenja troškova. Kliničko upravljanje, svest o bezbednosti pacijenata i isplativost su s vremenom dobili na značaju kod pružaoca zdravstvenih usluga. Ovo poglavlje istražuje upotrebu VR-a u zdravstvenom obrazovanju i da li je efikasnije od drugih nastavnih metoda u usvajanju kliničkih veština kod studenata medicine. Virtuelna stvarnost je, po svemu sudeći, jednako dobra kao i tradicionalne nastavne metode kada se radi o usvajanju kliničkih veština kod studenata medicine [2].

Četrnaesto poglavlje, pod nazivom „Virtuelna foto-realnost u obrazovanju za bezbednost“, govori o tome da je građevinarstvo industrija koja izaziva najviše nesreća i povreda. Obrazovanje za bezbednost je od suštinskog značaja za unapređenje bezbednosti radnika u građevinskoj industriji. Međutim, univerzitetski nastavni programi koji se odnose na polje bezbednosti su izolovani i ne pružaju dovoljno znanja i profesionalnih veština. Virtuelna foto-realnost (VP) je mnogim disciplinama omogućila korišćenje najsavremenijih tehnologija, zbog čega ovo poglavlje predlaže potpuno novi pristup obrazovanju o bezbednosti u građevinskoj industriji zasnovan na primeni virtuelne foto-realnosti. VP prototip je izgrađen na osnovu uobičajenih nezgoda na gradilištima. Preliminarni nalazi sugerisu da bi virtuelna foto-realnost mogla da se upotrebi za razvoj i poboljšanje obrazovanja o bezbednosti [5].

Petnaesto poglavlje, „Podsticanje imerzije u nauci o tlu kroz virtuelne konferencije na kojima se dele ideje među avatarima radi unapređenja obrazovanja mladih naučnika“ opisuje nastavno iskustvo u kome je kreirana imerzivna virtuelna konferencija za interakciju starijih istraživača i mladih naučnika koji se bave proučavanjem tla. Međunarodna konferencija poput Generalne skupštine Evropskog udruženja za geonauku je odlična prilika za doktorande da svoj rad predstavljaju stručnjacima i podele znanje sa drugima. Dat je pregled prethodne tri konferencije (2015–2017). Glavna pitanja su tehničke prirode. Ključna stvar bila je da konferencijski server bude u stanju da obezbedi pouzdanu internet vezu za tako veliki broj učesnika. Međutim, oni su takođe pohvalili opuštenu atmosferu i imerzivnost konferencije koja ih je podstakla da stupe u interakciju sa drugima, da se slobodno izražavaju i da koriste strani jezik. Nešto neformalniji format ovako inovativnih sastanaka povećava interakciju među učesnicima, a to je nešto što je mladim naučnicima važno [2].

Šesnaesto poglavlje, „Obrazovne tehnologije u oblasti sveprisutnog istorijskog računarstva u virtuelnoj stvarnosti“, navodi da se nove tehnologije javljaju sve češće, kao i da im je oblast primene sve šira i šira, a to važi i za VR i AR uređaje. Javni i obrazovni sektor, pored privatnog, imaju koristi od ovih tehnologija. Međutim, postoji tek nekoliko okvira koji su dovoljno fleksibilni da kreiraju imerzivna virtuelna okruženja, naročito na polju istorijskog obrazovanja. Ovo poglavlje popunjava tu prazninu pomoću VAnnotatoR-a, fleksibilnog okvira za kreiranje i upotrebu virtuelnih okruženja kojima se modeluju istorijski procesi. Pored toga, ovo poglavlje opisuje komponente VAnnotatoR alata i njegovu primenu u istorijskom obrazovanju.

Sedamnaesto poglavlje, pod nazivom „Primene virtuelne i proširene stvarnosti u ekološkom obrazovanju i obuci“, govori o senzorskim tehnologijama, grafičkim procesorima i veštačkoj inteligenciji koji su omogućili razvoj opšteprimenljivih i pristupačnih uređaja za proširenu stvarnost. Sada je moguće uroniti u najsavremenije simulacije koje u potpunosti podražavaju fiziku i scenarije iz stvarnog sveta. Aplikacije za virtuelnu i proširenu stvarnost mogu da pomognu javnosti, naučnicima, donosiocima odluka i profesionalcima da rade u realističnim i bezbednim okruženjima koja omogućavaju ponovljiva merenja. Ovo poglavlje daje pregled literature koja se bavi efikasnošću i efektivnošću virtuelne i proširene stvarnosti u ekološkim aplikacijama. Na primer, sistem za podršku odlučivanju u ekološkom planiranju i upravljanju katastrofama namenjen tehničkom osoblju i hitnim službama su obrazovni alati namenjeni K-12 obrazovanju (osnovna i srednja škola) i univerzitetskim studentima koji su zasnovani na mešovitoj stvarnosti. Konačno, razmatraju se budući pravci razvoja proširene (AR) i virtuelne (VR) stvarnosti za naredne generacije ekoloških informacionih sistema [2] [6–11].

Osamnaesto poglavlje, „ViMeLa: interaktivno okruženje za laboratorije mehatronike u virtuelnoj stvarnosti“, predstavlja metodu kombinovanog učenja pomoću teorijske nastave i virtuelne stvarnosti kao alata za eksperimentisanje. Rad je razvijen kao zajednički evropski projekat, ViMeLa. Glavni cilj jeste kreiranje laboratorije mehatronike gde će studenti učiti o mehatronici. Fleksibilna rešenja su razvijena u okviru projekta. Za potrebe demonstracije kreirani su slučajevi korišćenja: dizajn, konstrukcija i principi rada elektromotora, rešenja za industrijsku automatizaciju kojima se kontroliše sortiranje paketa u skladištu.

3. Urednica

Linda Danijela (Linda Daniela) je profesorka na Naučnom institutu za pedagogiju Univerziteta Letonije u Rigi i dekan Fakulteta pedagogije, psihologije i umetnosti Univerziteta Letonije, kao i predsednica univerzitetskog veća za promociju pedagogije. Njena istraživačka interesovanja uključuju primene obrazovne robotike u učenju i načine za smanjenje socijalne izolovanosti pomoću virtuelnog obrazovanja i inovativnih obrazovnih tehnologija. Profesorka Danijela je autorka i koautorka brojnih radova na temu obrazovnih procesa [12].

4. Zaključna razmatranja

Pošto veliki broj mladih odustaje od visokog obrazovanja, visokoobrazovne institucije veruju da će korišćenje tehnoloških resursa pomoći da se ova statistika promeni. Pronalaženje rešenja za primenu virtuelne, proširene i mešovite stvarnosti (XR), koje su popularne među mlađim generacijama, može da učini nastavu i praktičnu obuku u visokom obrazovanju privlačnijom za širu publiku. Istovremeno, entuzijazam studenata za učenje može se povećati pružanjem osećaja autonomije i mogućnosti da steknu kompetencije [13].

Iako rešenja poput virtuelne (VR), proširene (AR) i mešovite stvarnosti (MR) postoje već duže vreme, njihovu obrazovnu primenu tek treba detaljno proučiti. Međutim, ako pretpostavimo da je obrazovanje ključ za veći uspeh, nove ideje i bolje društvo, onda moramo verovati da obrazovanje treba da identifikuje i reši nove obrazovne i kulturološke probleme. U ovoj knjizi grupa istraživača se okupila kako bi razgovarala o tome kako virtuelna stvarnost može da unapredi sticanje specifičnog znanja, meri napredak u znanju i učini efikasnijim procese koji bi inače bili mnogo skuplji, opasniji, dugotrajniji ili neefikasniji.

Knjiga „Nove perspektive virtuelne i proširene stvarnosti: pronalaženje novih nastavnih pristupa u transformisanom okruženju za učenje” nas uči dragocenim lekcijama o primeni virtuelne stvarnosti u obrazovanju. Sadrži 18 poglavlja, koja pojašnjavaju različite tehnike za primenu VR i AR tehnologija. Pored toga, autori ispituju ove mogućnosti iz različitih perspektiva, uključujući sticanje znanja, efikasnost procesa učenja i potrebu za promenom načina gledanja na virtuelnu stvarnost.

Literatura

1. Routledge web page [Internet]. Available from: <https://www.routledge.com/New-Perspectives-on-Virtual-and-Augmented-Reality-Finding-New-Ways-to-Teach/Daniela/p/book/9780367432119>
2. L. Daniela (2020). *New Perspectives on Virtual and Augmented Reality Finding New Ways to Teach in a Transformed Learning Environment*. Routledge
3. Gamage, S. H., Ayres, J. R., & Behrend, M. B. (2022). A systematic review on trends in using Moodle for teaching and learning. *International Journal of STEM Education*, 9(1), 1–24.
4. Yin, W. (2022). An Artificial Intelligent Virtual Reality Interactive Model for Distance Education. *Journal of Mathematics*, 2022.
5. Pham, H. C., Dao, N. N., Kim, J. U., Cho, S., & Park, C. S. (2018). Energy-efficient learning system using web-based panoramic virtual photoreality for interactive construction safety education. *Sustainability*, 10(7), 2262
6. Villena-Taranilla, R., Tirado-Olivares, S., Cózar-Gutiérrez, R., & González-Calero, J. A. (2022). Effects of virtual reality on learning outcomes in K-6 education: A meta-analysis. *Educational Research Review*, 100434.
7. Chytas, D., Salmas, M., Skandalakis, G. P., & Troupis, T. G. (2022). Augmented and virtual reality in anatomy education: Can they be effective if they do not provide immersive experience?. *Anatomical Sciences Education*.
8. Cheng, K. H., Tang, K. Y., & Tsai, C. C. (2022). The mainstream and extension of contemporary virtual reality education research: Insights from a co-citation network analysis (2015–2020). *Educational Technology Research and Development*, 1–16.
9. Schott, C., & Marshall, S. (2021). Virtual reality for experiential education: a user experience exploration. *Australasian Journal of Educational Technology*, 37(1), 96–110.
10. Zhang, X., Shi, Y., & Bai, H. (2021). Immersive Virtual Reality Physical Education Instructional Patterns on the Foundation of Vision Sensor. *Journal of Sensors*, 2021.
11. Paszkiewicz, A., Salach, M., Dymora, P., Bolanowski, M., Budzik, G., & Kubiak, P. (2021). Methodology of implementing virtual reality in education for industry 4.0. *Sustainability*, 13(9), 5049.
12. ResearchGate Linda Daniela profile. [Internet]. Available from: <https://www.researchgate.net/profile/Linda-Daniela> (accessed 21.01.2022.)
13. Kuleto, V.; P., MI; Stanescu, M.; Ranković, M.; Sević, N.P.; Păun, D.; Teodorescu, S. Extended Reality in Higher Education, a Responsible Innovation Approach for Generation Y and Generation Z. *Sustainability* 2021, 13, 11814. <https://doi.org/10.3390/su132111814>



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“New Perspectives on Virtual and Augmented Reality: Finding New Ways to Teach in a Transformed Learning Environment”, Edited by Linda Daniela, Routledge, 2020, Book Review

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Abstract: The book “New Perspectives on Virtual and Augmented Reality: Finding New Ways to Teach in a Transformed Learning Environment” can be used in innovative pedagogy. There is an urgent need to teach and support learning in a transformed learning environment. Learning in a new way is made possible by technological advancements, but they also present educational institutions with new problems. Virtual reality solutions can be exciting, enthralling and accessible, and they can speed up the process of education. As a resource for educators, this book examines the potential of virtual reality, augmented reality, and mixed reality (VR/AR) to enhance learning, and how these technologies can be used in the classroom. As a tool for knowledge construction and the development of metacognitive processes, virtual reality (VR) solutions can be an effective educational tool. As a result, they help broaden the scope of educational opportunities for students from all backgrounds. Academics, researchers, and post-graduate students in educational technology will find this book invaluable.

Key terms: virtual reality, mixed reality, augmented reality, learning environment, educational technology

1. Introduction

Technological advances and digitalisation opportunities are transforming the educational environment in various ways. Therefore, it is necessary to provide the acquisition of essential competencies in today’s world and ensure that the fascination with technology does not override learning goals. In this book, researchers examine the capabilities of virtual, augmented, and mixed reality by suggesting ways to improve learning, use existing VR/AR solutions as learning tools, and structure a learning process. VR/AR solutions can help people learn things that would otherwise be impossible or difficult to understand. There are several reasons why VR solutions can be used successfully in education: they can help to reduce barriers to otherwise inaccessible places, either because of changes in the historical period or because it is necessary to preserve historical and natural values from human influence; they can help to ensure that abstract learning becomes concrete by helping to master complex concepts, and they can help to ensure inclusive ed. These possibilities can and should be used to improve understanding. As VR/AR solutions have to do with educational shortages resulting from underachievement, researchers are currently looking at various ways to use VR/AR solutions in education to make the education process more efficient, modern, and diverse. They are also looking for technical solutions to make VR more accessible and appealing.

2. Structure of the book

The book “Finding New Ways to Teach in a Transformed Learning Environment” is structured in three parts. Part I, VIRTUAL REALITY IN HUMANITIES AND SOCIAL SCIENCES, comprises seven chapters. Part II, CONCEPTS OF VIRTUAL REALITY, contains five chapters, and Part III, VIRTUAL REALITY IN SCIENCES AND MEDICAL EDUCATION, comprises five chapters. The book contains 322 pages and includes 67 B/W Illustrations [1].

The first chapter, entitled “Virtual Reality Learning Experience Evaluation Tool for Instructional Designers and Educators”, discusses the fact that, with the advent of virtual learning environments and virtual learning experiences, instructional designers and educators can focus on the context and background of learning rather than just the material. There is much study on virtual reality’s technological solutions and limitations (VR). However, it is still difficult for educators and instructional designers to find guidelines for building VR learning experiences to ensure learning objectives are met. As a result, current VR learning research appears to struggle with comprehending the basic principles of this process and how they relate to existing learning theories, instructional practices, and curriculum. With the rapid growth of VR learning, it is necessary to systematise the pedagogical concepts that govern and assist VR learning. This chapter introduces a VR learning experience evaluation tool highlighting key aspects instructors and educators should consider when designing and implementing VR learning experiences [2]. High fidelity graphics and immersive content using head mounted displays (HMD) have allowed students to explore complex subjects in a way that traditional teaching methods cannot [3-4].

Chapter two, entitled: “The educational perspective on Virtual Reality experiences of cultural heritage”, discusses how humans have always imagined virtual reality. Initially, VR was primarily linked with the ICT business, but subsequently, the military and medical industries were interested in its potential. Now VR is entering the realm of education, proposing new learning methods, opportunities, and outcomes. Virtual reality can transform education because technology allows students

to experience things that are impossible in the actual world. VR offers a massive range of possibilities, but educational goals must be met. While it is true that VR may enhance learning, we must guarantee that knowledge is not lost in the VR craze. The chapter explores the educational potential of VR experiences and presents an evaluation tool used in order to assess four cultural heritage VR experiences.

The third chapter, "The Potentials of Virtual Reality in Entrepreneurship Education", considers contemporary entrepreneurship that entices people to use their skills and abilities to create new services and products that meet market needs. However, starting a new company venture is an uncertain and unstable process that requires a developed mental model to make sense of and make decisions. Entrepreneurship education equips people with the information and abilities necessary in order to identify relevant opportunities and risks, but it often lacks practical teaching tools. Therefore, examining virtual reality as a technological and supplementary tool that allows users to learn and develop abilities by immersing themselves in virtual worlds is a vital first step [2].

Chapter four, entitled "Mixed Reality applied theatre at universities", speaks about mixed reality (MR) educational concepts for a university applied theatre class. In applied theatre, people work together to better their neighbourhood. A lesson plan is developed using Augusto Boal's Theatre of the Oppressed and MR's interface design patterns. A dramaturgical pedagogy based on MR affordances and Boal's methods allows for new ways of thinking about communal challenges. The lesson plan was developed at Georgia Tech to address campus safety issues. The workshop participants believed they gained unique knowledge about safety from both MR and constructivist performance exercises. The students also felt their work might benefit the university campus. Beyond the lesson plan, educators wishing to incorporate MR into their own applied theatre practices will find various further possibilities. A lesson plan is developed using Augusto Boal's Theatre of the Oppressed and MR's interface design patterns. The theatre and academia should address the following question: What is mixed reality, and why theatre should care? What is scenography of mixed reality environments? What is the role of mixed reality technology as an integral part of the experiential artistic design process for education?

Chapter five, "Development of professional skills in higher education: problem-based learning supported by immersive worlds", encourages the acquisition of professional skills related to solving real-world situations using active teaching approaches. Developing these competencies for literate individuals in the knowledge society is a multi-stakeholder process. This chapter shows a project to build engineering and mathematics teaching professional abilities utilising environments replicated in immersive worlds. Interaction with professionals from several fields has been highlighted. Several role-playing scenarios for public contracts, technical support, and curriculum design were created. These scenarios were created by industry experts (policymakers, owners, etc.) and built into an immersive worlds environment. As a result, students interacted as diverse stakeholders in the processes, working on the corresponding documentation and assessing the professional role. The experience was evaluated based on students' opinions of their professional tasks. This learning experience increased participants' professional confidence. Immersive worlds can construct educational proposals that evoke student involvement and skill development [2].

Chapter six, "Virtual Reality and Augmented Reality in Educational Programs", discusses how these technologies have existed for years and can be used on smartphones, iPads, and computers. VR and AR can be used in education at various levels. This chapter introduces VR and AR education and discusses their use in educational programmes related to medicine, sports, military, and history.

Chapter seven, "An Exploration of the Impact of Augmented and Virtual Reality Within Compulsory Education", examines the use of augmented and virtual reality in the UK between the ages of 5 and 18. The chapter examines current research on primary studies of its use in the specified age range to assess the impact of augmented and virtual reality on the curriculum [2].

Part two, CONCEPTS OF VIRTUAL REALITY contains five chapters [2]. Chapter eight, "Transcendent Learning Spaces", discusses how emerging technologies like augmented and virtual reality can be used to model real-life situations in the digital world. As long as they are used with a sound pedagogical foundation, they can provide powerful educational experiences beyond traditional classrooms. We need to gain a better understanding of the ways in which the human brain processes these simulations or enhancements of reality to achieve this. The concept of transcendence is essential to grasping their value. Virtual and augmented reality learning spaces provide students with emotional reinforcement and stimulation in a transmedia environment. They can be highly effective for many learner populations, including those at risk of exclusion or in an educational crisis.

Chapter nine, entitled "Enhancing trust in virtual reality systems", discusses how virtual reality (VR) technology has gained popularity in recent years, both in entertainment and business. VR systems are widely used in healthcare, training, and education. VR has clear educational advantages over other technologies, and its use in learning and teaching is growing. However, users' trust must be considered for any technology to be effective and used. This is true for VR and tech. Various studies have shown that untrusted e-learning systems can be ineffective and even cause higher dropout rates. This chapter describes a study designed to test the influence of usability, technology acceptance, and presence on trust in a VR model. The results help validate the model, which could shape VR technology design to improve user trust, human-system interaction, and technology effectiveness when fully demonstrated [2].

Chapter ten is entitled "Simulation data visualisation by using Mixed Reality with Microsoft HoloLens TM". Simulations and testbeds are complex topics for mechanical engineering students and new employees. HoloLens is used in order to visualise CAD models, sensor data, and simulation data from a test run on an air conditioning system testbed. Temperature and pressure changes are challenging to see in opaque parts like tubes, compressors, condensers, or electrical expansion valves. The HoloLens app supports virtual reality and CAD. For example, MR overlays were used to colourise temperature and pressure changes on the testbed. The HoloLens app is designed to reduce the time and effort required to understand simulations and testbeds. The app could also be used for sharing knowledge and experiences between departments [2].

Chapter eleven, entitled "A+Ha!: combining tactile interaction with augmented reality to transform secondary and tertiary STEM education", argues that using novel technologies that combine haptic interaction with pedagogically strategic digital augmentation to promote the faster and more effective acquisition of subject matter intuition (e.g. structural mechanics) can significantly improve the effectiveness, accessibility, and engagement in STEM teaching and learning in secondary and tertiary education [2].

Chapter twelve, entitled "The Use of Fuzzy Angular Models and 3D Models on a Construction Method Assessment on the Great Wall of China in Jinshanling as a Case Study of the History and Heritage of Civil Engineering in Education", introduces three possible construction methods that were likely implemented during the building of the walls and towers of the Jinshanling section of the Great Wall of China during the Ming Dynasty period. The lack of data concerning ancient construction methods

in this region warrants a subjective assessment approach using the fuzzy modus ponens deduction technique. Fuzzy angular models were selected and employed to determine the most likely and feasible construction methods and sequences. Factors contributing to method selections include the availability of labour, materials and equipment; soil condition and existing structures and accessibility to the site and storage of materials. While each method might have its advantages and disadvantages, the modus ponens deduction technique using fuzzy angular models suggests that the first method associated with simultaneous sequence from both the inside and outside for both the walls and towers has the highest likelihood of having been implemented by ancient Chinese construction workers. The same methodology can be applied to recreating construction sequences for other old structures in engineering courses. The results can be displayed in virtual reality (VR), with or without the fuzzy logic methodology, suitable for teaching in primary, secondary and university classroom settings [2].

Part III, VIRTUAL REALITY IN SCIENCES AND MEDICAL EDUCATION, comprises five chapters. Chapter thirteen, "Virtual Reality for Teaching Clinical Skills in Medical Education", discusses how virtual reality (VR) has become a viable method of teaching clinical skills to medical students due to technological advances and cost reductions. Over time, clinical governance, patient safety awareness, and cost efficiency have become more critical to healthcare providers. This chapter examines the use of VR in healthcare education and whether it is more effective than other methods of teaching clinical skills to medical students. VR is likely to be as good as traditional methods of medical education for clinical skills. [2].

Chapter fourteen called "Virtual Photoreality for Safety Education" discusses the industry that causes the most accidents and injuries is construction. Safety education is critical to improving worker safety before entering the construction industry. However, university safety curricula are isolated and lack knowledge and professional skills. Virtual Photoreality (VP) has enabled many disciplines with cutting-edge technology. As a result, the chapter proposes a novel VP-based construction safety education approach. A VP prototype is presented based on standard construction site accidents. Preliminary findings suggest that VP could be used to promote safety education [5].

Chapter fifteen "Encouraging immersion in the Soil Sciences through virtual conferences where ideas are shared among avatars to improve the educational background of young scientists" describes a teaching experience where an immersive virtual conference was created for senior researchers and young soil scientists to interact. An international conference like the European Geosciences Union Assembly is an excellent opportunity for PhD students to present their work to experts and share their knowledge with others. An overview of the last three conferences (2015–2017) is provided. The main issues were technical. It was critical that the conference server could provide a reliable internet connection for many attendees. However, they praised the fun atmosphere and the sense of immersion, which encouraged them to interact, express themselves freely, and use a foreign language. The less formal format of these innovative meetings increased participant interaction, which the young scientists valued [2].

Chapter sixteen entitled "Educational Technologies in the area of ubiquitous historical computing in virtual reality" points out that new technologies emerge with an ever-increasing frequency, expanding application areas. This includes VR and AR devices. The public and education sectors, in addition to the private sector, benefit from these technologies. However, few frameworks are flexible enough to create immersive virtual environments, especially historical education. This chapter fills this void using VAnnotatoR, a flexible framework for creating and using virtual environments that model historical processes. In addition, this chapter describes VAnnotatoR's components and uses in historical education.

Chapter seventeen, entitled "Virtual and Augmented Reality Applications for Environmental Science Education and Training" discusses sensing technologies, graphics processors, and artificial intelligence that have enabled the development of generalised and affordable virtual and augmented reality devices. Individuals can now immerse themselves in cutting-edge simulations with real-world physics and scenarios. Virtual and augmented reality applications can help the public, scientists, decision-makers, and professionals work in a realistic and safe environment with repeatable measurements. This chapter reviews the literature on the effectiveness and efficiency of using virtual and augmented reality in environmental applications. For example, a decision support system for environmental planning and disaster management and a training platform for technical staff and first responders are examples of mixed reality (XR) educational tools for K-12 and college-level students. Finally, future directions for augmented reality (AR) and virtual reality (VR) for next-generation environmental information systems are discussed [2] [6–11].

Chapter eighteen, entitled "ViMeLa: Interactive Educational Environment for Mechatronics Lab in Virtual Reality" presents a blended-learning method using theory classes and virtual reality (VR) as an experimentation tool. The work has been developed as a joint European project, ViMeLa. The main objective is to create a virtual mechatronic laboratory for learning and teaching students in mechatronics. Within the frame of the project, flexible solutions are developed. For demonstration purposes, use-cases were created: design, construction and operating principles of electric motors; industrial automation solution for controlling the sorting of packages in a warehouse.

3. Editor

Linda Daniela is a professor at the University of Latvia's Scientific Institute of Pedagogy in Riga, Latvia, and serves as Dean of the University of Latvia's Faculty of Education, Psychology and Art, and Chair of the university's Council for Promotion of Pedagogy. Her research interests include educational robotics for learning and ways to reduce social exclusion through virtual education and innovative education technology. Professor has authored and co-authored numerous works on educational processes [12].

4. Concluding remarks

As many young people are choosing not to pursue higher education, HEI believes that utilising technological resources will help boost this level of education. Finding solutions for the use of XR, which is popular with the younger generations, in higher education can help make academics and practical training more appealing to a broader audience. At the same time, students' enthusiasm for learning can be increased by providing them with a sense of autonomy and competence [13].

While digital solutions like virtual reality (VR), mixed reality (MR), and augmented reality (AR) have been around for some time, their educational applications have yet to be thoroughly explored. However, suppose we believe that education is the key

to more tremendous success, new ideas, and a better society. In that case, we must also believe that education must look for and solve any further problems in education or culture. In this book, a group of researchers have come together to discuss how virtual reality (VR) can improve the acquisition of specific knowledge, measure knowledge progress, and make processes that would otherwise be more expensive, dangerous, time-consuming or ineffective more efficient.

The book "New Perspectives on Virtual and Augmented Reality: Finding New Ways to Teach in a Transformed Learning Environment" teaches valuable lessons from virtual reality in education. There are 18 chapters in this book devoted to explaining various techniques for using VR and AR. In addition, several authors examine these possibilities from multiple perspectives, including knowledge gain, the effectiveness of the learning process, and the need for a shift in views toward VR.

References

1. Routledge web page [Internet]. Available from: <https://www.routledge.com/New-Perspectives-on-Virtual-and-Augmented-Reality-Finding-New-Ways-to-Teach/Daniela/p/book/9780367432119>
2. L, Daniela (2020). New Perspectives on Virtual and Augmented Reality Finding New Ways to Teach in a Transformed Learning Environment. Routledge
3. Gamage, S. H., Ayres, J. R., & Behrend, M. B. (2022). A systematic review on trends in using Moodle for teaching and learning. *International Journal of STEM Education*, 9(1), 1–24.
4. Yin, W. (2022). An Artificial Intelligent Virtual Reality Interactive Model for Distance Education. *Journal of Mathematics*, 2022.
5. Pham, H. C., Dao, N. N., Kim, J. U., Cho, S., & Park, C. S. (2018). Energy-efficient learning system using web-based panoramic virtual photoreality for interactive construction safety education. *Sustainability*, 10(7), 2262
6. Villena-Taranilla, R., Tirado-Olivares, S., Cózar-Gutiérrez, R., & González-Calero, J. A. (2022). Effects of virtual reality on learning outcomes in K-6 education: A meta-analysis. *Educational Research Review*, 100434.
7. Chytas, D., Salmas, M., Skandalakis, G. P., & Troupis, T. G. (2022). Augmented and virtual reality in anatomy education: Can they be effective if they do not provide immersive experience?. *Anatomical Sciences Education*.
8. Cheng, K. H., Tang, K. Y., & Tsai, C. C. (2022). The mainstream and extension of contemporary virtual reality education research: Insights from a co-citation network analysis (2015–2020). *Educational Technology Research and Development*, 1–16.
9. Schott, C., & Marshall, S. (2021). Virtual reality for experiential education: a user experience exploration. *Australasian Journal of Educational Technology*, 37(1), 96–110.
10. Zhang, X., Shi, Y., & Bai, H. (2021). Immersive Virtual Reality Physical Education Instructional Patterns on the Foundation of Vision Sensor. *Journal of Sensors*, 2021.
11. Paszkiewicz, A., Salach, M., Dymora, P., Bolanowski, M., Budzik, G., & Kubiak, P. (2021). Methodology of implementing virtual reality in education for industry 4.0. *Sustainability*, 13(9), 5049.
12. ResearchGate Linda Daniela profile. [Internet]. Available from: <https://www.researchgate.net/profile/Linda-Daniela> (accessed 21.01.2022.)
13. Kuleto, V.; P, MI; Stanescu, M.; Ranković, M.; Šević, N.P.; Păun, D.; Teodorescu, S. Extended Reality in Higher Education, a Responsible Innovation Approach for Generation Y and Generation Z. *Sustainability* 2021, 13, 11814. <https://doi.org/10.3390/su132111814>



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Prilozi Uredništva / Editorial appendixes**O časopisu**

EdTech Journal je naučni časopis otvorenog pristupa posvećen korišćenju informacionih tehnologija u obrazovanju. Ipak, u našoj „Naučnoj politici“ priznajemo važnost istinske upotrebe IT-ja u društvu i privredi, jer obrazovanje predstavlja vitalni sektor društva. Obrazovanje za potrebe privrede i koncepti zasnovani na njemu su prekretnice koje se moraju uzeti u obzir pri razvoju budućeg opsega sektora obrazovanja.

Zašto EdTech? Računarski hardver, softver i obrazovna teorija i praksa stvaraju obrazovnu tehnologiju (EduTech ili EdTech). EdTech je skraćenica za opisivanje poslovanja razvoja obrazovne tehnologije. Pored informacionih tehnologija, u obrazovnu tehnologiju je zajedno sa praktičnim iskustvom ugrađen i širok spektar teorijskih znanja iz različitih oblasti kao što su komunikacija, obrazovanje, psihologija i sociologija. Teorija učenja, obuke zasnovane na računaru, onlajn-učenje i m-učenje, gde se koriste mobilne tehnologije, uključeni su u ovaj krovni termin. Disciplina se razvija dok o njoj govorimo, baš kao i IT i računarske nauke.

Primenjene obrazovne nauke, kao što su oprema, procesi i procedure proistekli iz naučnih istraživanja, uključeni su u „obrazovnu tehnologiju“, pozivajući se na teorijske, algoritamske ili heurističke pristupe u zavisnosti od konteksta. Obrazovne ustanove moraju imati najsavremenije tehnologije kao saveznike u svakodnevnom funkcionisanju. Nastavnici uče kako da poboljšaju svoje rezultate i budu najefikasniji koristeći različita IT rešenja. Učenici uče kako da koriste računare i drugu tehnologiju u učionici i završavaju svoje zadatke u raznovrsnijem i inkluzivnijem okruženju kroz obrazovnu tehnologiju.

Zato EdTech Journal podržava doprinose autora i istraživača iz različitih disciplina i naučnih oblasti koje su opisane u našoj „Naučnoj politici“, a koje se dotiču računarske nauke i IT-ja. Informaciona tehnologija pod kojom se podrazumeva upotreba računarskih programa za rešavanje poslovnih procesa ima višestruku primenu. Nova rešenja se integrišu u poslovni, obrazovni i društveni okvir svakodnevno, koristeći informacione tehnologije.

Dr Valentin Kuleto

Glavni i odgovorni urednik

About the Journal

EdTech Journal is a scientific open-access journal dedicated to the use of information technology in education. In our Scientific Policy, we acknowledge the importance of the genuine use of IT in society and the economy because education is a vital sector of society and education for the needs of the economy, and the concepts based on it are milestones that must be taken into account when developing the future scope of the education sector.

Why EdTech? Educational technology (EduTech, or EdTech) encompasses computer hardware, software, and educational theory and practice. EdTech is a commonly used abbreviation to describe the business of developing educational technology. A wide range of theoretical knowledge from various fields alongside information technology, such as communication, education, psychology and sociology, is incorporated into educational technology in addition to practical experience. Learning theory, computer-based training, online learning, and m-learning, which use mobile technologies, are all included in this umbrella term. The discipline develops as we speak, just like IT and computer sciences.

Applied educational sciences, such as equipment, processes, and procedures derived from scientific research, are all included in “educational technology,” referring to theoretical, algorithmic, or heuristic approaches depending on the context. Education institutions must have cutting-edge technologies as an ally in everyday functioning. Educators learn how to improve their outcomes and be most effective using various IT solutions. Students learn how to use computers and other technology in the classroom and complete their assignments in a more diverse and inclusive environment through educational technology.

That is why EdTech Journal welcomes the contributions of authors and researchers from various disciplines and scientific fields implemented in our Scientific Policy that feel computer science and IT. Information technology - the application of computer programs to solve business processes - has a wide range of beneficial applications. New solutions are integrated into the business, education and social framework utilizing information technology on a daily basis.

Dr Valentin Kuleto

Editor-in-Chief

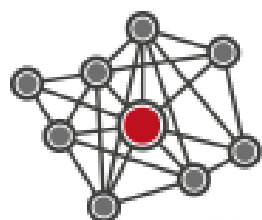
Izdavač

Izdavač Naučnog časopisa za savremeno obrazovanje i primenu informacionih tehnologija – EdTech Journal je Institut za moderno obrazovanje (IMO), Beograd, Srbija. Cilj Instituta za moderno obrazovanje (IMO) je unapređenje kvaliteta obrazovnog procesa kroz edukaciju sadašnjih i budućih zaposlenih u obrazovanju i promociju najsavremenijih obrazovnih tehnologija. Misija IMO je pomoć pojedincima da postanu uspešniji, kao i pomoć školama i obrazovnim ustanovama u implementaciji tehnologija i tehnika za unapređenje obrazovnog procesa. IMO je i savetodavni centar za sve lidere u obrazovanju, kao i mesto profesionalne nastavne prakse za buduće profesore.

IMO je deo vodeće multinacionalne EdTech kompanije LINKgroup, koja se 25 godina uspešno bavi profesionalnom edukacijom i sertifikacijom u oblasti informacionih tehnologija i savremenog poslovanja. Kao kompanija koja se bavi edukacijom u različitim sferama, LINKgroup je prisutan u Srbiji, Hrvatskoj, Bosni i Hercegovini, Rumuniji, Ukrajini, Moldaviji i Sjedinjenim Američkim Državama, a putem jedinstvenog e-Learning sistema za učenje na daljinu okuplja polaznike iz preko 120 zemalja sveta.

U okviru LINKgroup obrazovnog sistema (LINK Educational Alliance) postoji više od pedeset obrazovnih institucija i obrazovnih servisa. LINK Educational Alliance na jednom mestu okuplja obrazovne institucije bez obzira na naučnu oblast i nivo obrazovanja, kao i kompanije i pojedince koji su svesni da samo celoživotno učenje i usavršavanje donosi profesionalni uspeh.





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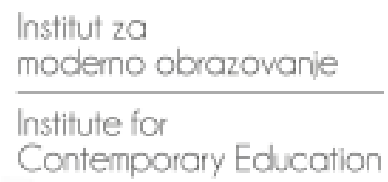
Publisher

The publisher of the Scientific Journal for Contemporary Education and Application of Information Technologies – EdTech Journal is the Institute for Contemporary Education (ICE), Belgrade, Serbia. The Institute for Contemporary Education (ICE) aims to improve the quality of the educational process through the education of current and future employees in education and the promotion of the most modern educational technologies. The ICE's mission is to help individuals become more successful and support schools and educational institutions in implementing technologies and techniques to improve the educational process. ICE is also an advisory centre for all leaders in education and a place of professional teaching practice for future professors.

ICE is part of the leading multinational EdTech company LINK group, which has been successfully engaged in professional education and certification in information technology and modern business for more than 20 years. As a company involved in teaching in various fields, LINK group is present in Serbia, Croatia, Bosnia and Herzegovina, Romania, Ukraine, Moldova and the United States, and a unique e-learning system for distance learning brings together students from over 120 countries.

There are more than fifty educational institutions and services within the LINK group education system (Link Educational Alliance). The LINK Educational Alliance brings together educational institutions regardless of scientific field and level of education and companies and individuals who are aware that only lifelong learning and improvement brings professional success.







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Naučna politika časopisa

Kvalitetno obrazovanje je osnov napretka i uspeha pojedinca i društva – dr Valentin Kuleto

U pogledu naučnih polja kojima časopis pretežno pripada, reč je o dva naučna polja: tehničko-tehnološke nauke (elektronika i informacione tehnologije) i društveno-humanističke nauke (pravo, ekonomija i političke i organizacione nauke) i društveno-humanističke nauke (filozofija, psihologija, pedagogija i sociologija). Časopis neguje internacionalne, ali i identitetske nauke, posvećen je sledećim naučnim oblastima:

elektrotehničko i računarsko inženjerstvo; organizacione nauke; menadžment i biznis, pedagoške i andragoške nauke; ekonomske nauke, političke nauke; pravne nauke; psihološke nauke; sociološke nauke; filozofija; nauke o umetnostima.

- distance-learning sistemi;
- internet;
- informacione tehnologije;
- informacioni sistemi;
- digitalne kompetencije;
- mreža 5G;
- veštačka inteligencija (artificial intelligence – AI);
- autonomni uređaji (roboti, odnosno korišćenje veštačke inteligencije za automatizaciju funkcija koje inače obavljaju ljudi);
- blokčejn tehnologija (blockchain);
- proširena analitika (augmented analytics): big data u kombinaciji sa veštačkom inteligencijom, odnosno korišćenje mašinskog učenja za automatsko učenje i optimizaciju odluka korišćenjem dubinskih analiza podataka;
- *digitalni blizanci* (digital twins), odnosno virtualne replike stvarnog sveta ili entiteta;
- poboljšani edge computing (Internet of Things, komplementarni modeli sa rešenjima u kladu);
- iskustva u pametnim prostorima – smart spaces (virtualna realnost – virtual reality (VR), proširena realnost – augmented reality (AR) i mešovita realnost – mixed reality (MR));
- inovacije u privredi
- menadžment;
- marketing;
- preduzetništvo (digitalno preduzetništvo, socijalno preduzetništvo);
- poslovna ekonomija;
- ekonomija u zdravstvu;
- poslovni informacioni sistemi;
- pedagogija i andragogija;
- poslovno pravo;
- primena IT-ja u obrazovanju;
- inovacije u obrazovanju;
- održivo obrazovanje;
- daroviti učenici;
- obrazovanje 4.0;
- NEETs;
- digitalna umetnost i data art;
- nauke o umetnosti;
- kultura;
- komunikologija;

druge oblasti od interesa za primenu informacionih tehnologija u društvu, privredi i obrazovanju.

U pogledu teorijskih i metodoloških smernica za obavljanje radova, časopis preporučuje IMRAD format za originalne naučne članke i PRISMA format za pregledne radove. Naučni radovi se upućuju na najmanje 2 recenzije, a stručni na najmanje jednu recenziju. Sve recenzije su *double-blind*.

Časopis koristi softver za proveru originalnosti i proverava originalnost svakog članka koji dobije pozitivne recenzije i preporuke recenzenata za objavu.

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radovi su vidljivi u celini na sajtu časopisa.

Društvena, državna i kulturna uloga časopisa ogleda se u priznavanju značaja i uloge informacionih tehnologija i na njima zasnovanih rešenja u oblasti društva, privrede i obrazovanja.

Opšti, naučni i društveni karakter časopisa ogleda se u deljenju znanja, rezultata naučnoistraživačkog rada i promocije nauke.

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U Beogradu, 29. 12. 2021. godine

Glavni i odgovorni urednik

dr Valentin Kuleto



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The Scientific Policy of the Journal

Quality education is the basis of progress and success of the individual and society – Dr Valentin Kuleto

Regarding the scientific fields that the journal is mostly concerned with, there are two: technical-technological sciences (electronics and information technology) and social-humanistic sciences (law, economics and political and organisational sciences) and social-humanistic sciences (philosophy, psychology, pedagogy and sociology). The journal nurtures international and identity sciences, and it is dedicated to the following areas:

electrical and computer engineering; organisational sciences; management and business; pedagogical and andragogical sciences; economic sciences; political science; legal sciences; psychological sciences; sociological sciences; philosophy; the sciences of the arts.

In terms of thematic guidelines for publishing papers, the journal welcomes papers from the areas including, and not limited to:

- e-learning;
- distance-learning systems;
- Internet;
- information technology;
- information systems;
- digital competences;
- 5G network;
- artificial intelligence (AI);
- autonomous devices (robots, i.e. the use of artificial intelligence to automate functions usually performed by humans);
- blockchain technology;
- augmented analytics: big data combined with artificial intelligence, i.e. the use of machine learning for automatic learning, and optimisation of decisions using in-depth data analysis;
- digital twins, or virtual replicas of the natural world or entities;
- edge computing (Internet of Things, complementary models with solutions in the cloud);
- experiences in smart spaces (virtual reality – VR, augmented reality – AR and mixed reality – MR);
- innovations in the economy;
- management;
- marketing;
- entrepreneurship (digital entrepreneurship, social entrepreneurship);
- business economics;
- health economics;
- business information systems
- pedagogy and andragogy;
- business law;
- application of IT in education;
- innovation in education;
- sustainable education;
- gifted student;s
- Education 4.0;
- NEETs;
- digital art and data art;
- the science of art;
- culture;
- communication science;

and other areas of interest for the application of information technology in society, economy and education.

Regarding theoretical and methodological guidelines for papers, the journal recommends the IMRAD format for original scientific articles and the PRISMA format for paper reviews. Scientific articles are submitted for at least 2 reviews, and professional articles for at least one review. All reviews are double-blind.

The journal uses authentication/plagiarism software and verifies the authenticity of each article that receives

positive reviews and reviewers' recommendations for publication.

The journal is open access and does not charge a fee for processing papers or their publication. In addition, all published scientific papers are visible in their entirety on the journal's website.

The social, national and cultural role of the journal is reflected in the recognition of the importance and role of information technologies and solutions based on them in society, economy and education.

The general, scientific and social character of the journal is reflected in the sharing of knowledge and the results of scientific research, and promotion of science.

Regarding the policy of self-archiving, the author is allowed to make visible the published version of the article – Publisher's PDF, Version of Record, VoR, indicating where and when it was published. Authors are permitted to deposit the published version of their work in an institutional or subject-based repository, or post it on their personal websites (including their profiles on social networks, such as ResearchGate, Academia.edu, etc.), and on the website of their affiliated institution, at any time after publication in the journal. In the process, the authors are obliged to provide full bibliographic information about the paper published in this journal (authors, article title, journal title, volume, issue, pages), as well as the relevant links concerning the article's DOI and the license used.

Belgrade, 29 December 2021

Editor-in-Chief

Dr Valentin Kuleto



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Na osnovu Statuta Instituta za moderno obrazovanje, član 3, stav 7, i Poslovnika o radu Uređivačkog odobora sa pravilnikom o uređivanju, Uređivački odbor Naučnog časopisa za savremeno obrazovanje i primenu informacionih tehnologija EdTech Journal na sednici održanoj dana 29. 12. 2021. godine donosi sledeći:

Etički kodeks Naučnog časopisa za savremeno obrazovanje i primenu informacionih tehnologija – EdTech Journal

Članovi Uređivačkog odbora Naučnog časopisa za savremeno obrazovanje i primenu informacionih tehnologija – EdTech Journal nadziru primenu etičkih standarda u naučnoistraživačkom i izdavačkom radu i odgovorni su za očuvanje etike izdavača časopisa, Instituta za moderno obrazovanje. Nadzor podrazumeva detaljnu kontrolu nad plagijarizmom i podnošenjem netačnih informacija i kršenjem autorskih prava, kao i izjašnjenje o uočenom, ispravku, uklanjanje rukopisa i druge korake.

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U Beogradu, 29. 12. 2021. godine

Glavni i odgovorni urednik

dr Valentin Kuleto



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Belgrade, 29 December 2021

Editor-in-Chief

Dr Valentin Kuleto



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3. Rezultati

U ovom segmentu poželjni su međunaslovi. On treba da pruži jezgrovit i precizan pregled rezultata eksperimenata, njihove interpretacije, kao i zaključaka koji se mogu izvesti.

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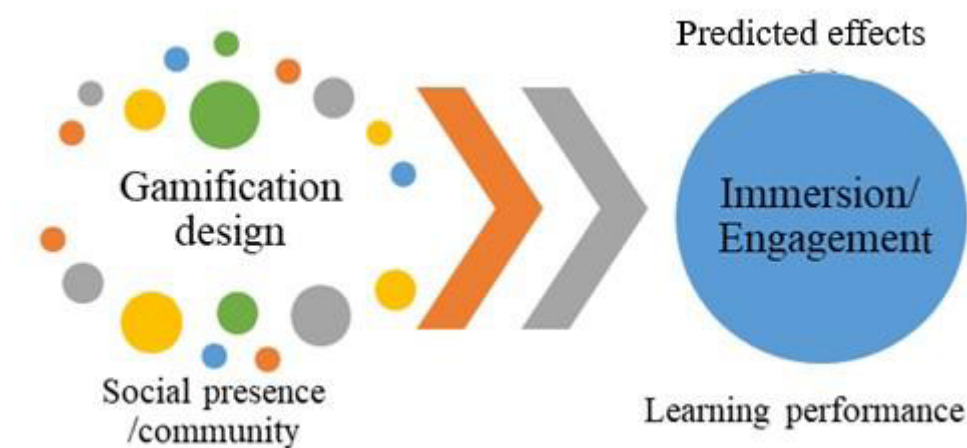
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Lista sa nabrojanjem treba da izgleda ovako:

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3.2. Slike, tabele i shematski prikazi

U glavnom tekstu, navodite sve slike i tabele kao Slika 1, Tabela 1 itd.



Slika 1. Veza između dizajna gejmfikacije i obrazovnih rezultata, adaptirano prema [16].

¹ Tabele mogu imati legendu (footer).

Tabela 1. Tabele treba postavljati u tekst u blizini mesta na kom se prvi put pominju.

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Tekst se nastavlja ovde (Slika 2 i Tabela 2).

Primer jednačine:

$$a = b + c + d + e + f + g + h + i + j + k + l$$

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Ukoliko je debata veoma duga ili kompleksna, u rukopis se može uvrstiti ovaj segment. Poželjan je pogotovo ako se ne koristi IMRAD model.

Dodatak (Appendix) 1

Dodatne informacije ili podaci mogu se navesti u dodatku – npr. objašnjenja detalja eksperimenta koja bi inače poremetila tok glavnog teksta, ali su ipak značajna za razumevanje i ponavljanje istraživanja predstavljenog u glavnom tekstu, odnosno slike ili replike koje se odnose na eksperimente za koje su reprezentativni podaci navedeni u glavnom tekstu. Dodatak se može iskoristiti i za izvođenje matematičkih dokaza rezultata koji nisu od fundamentalnog značaja za rad.

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4. Borges JL. *Selected non-fictions*. Weinberger E, editor. New York: Viking; 1999.
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6. Einstein A. On the electrodynamics of moving bodies. *Ann Phys* [Internet]. 1905;17:1–26. Available from: <http://bavard.fourmilab.ch/etexts/einstein/specrel/specrel.pdf>
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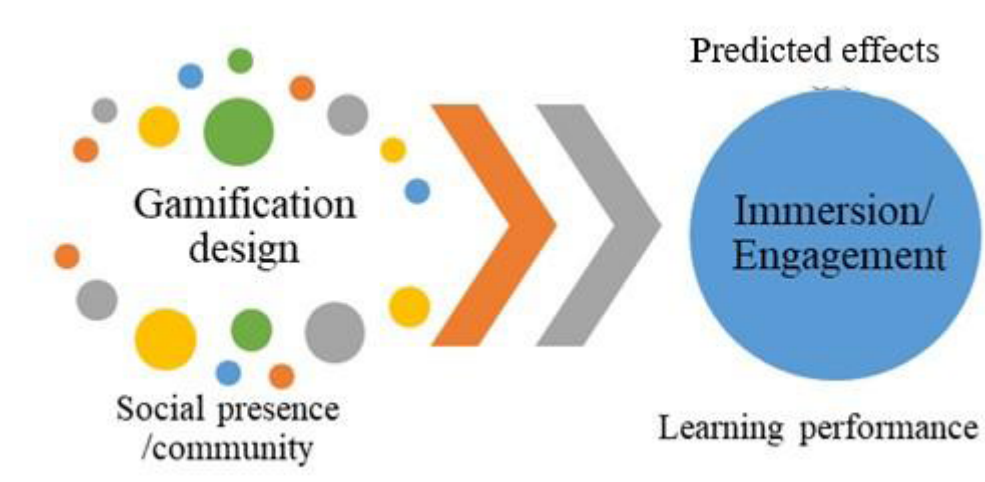
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¹ Figures may have a footer.

Figure 1. Relating gamification design with the education performance, adaptation after [16].

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Results and how they can be understood from the perspective of past studies and working hypotheses should be discussed in detail by the author(s). We must consider all the possible outcomes of our results and their consequences. There are also possibilities for future study directions to be mentioned here.

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Acknowledgements

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3. Ahlquist JS, Breunig C. Country clustering in comparative political economy [Internet]. Cologne: Max-Planck Institute for the Study of Societies; 2009 p. 32. Report No.: 09–5. Available from: www.mpifg.de/pu/mpifg_dp/dp09-5.pdf
4. Borges JL. *Selected non-fictions*. Weinberger E, editor. New York: Viking; 1999.
5. Dunnett N, Kingsbury N. *Planting green roofs and living walls*. 2nd ed. Portland, OR: Timber Press; 2008.
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7. Foderaro LW. Rooftop greenhouse will boost city farming. *New York Times*. New York; 2012 Apr 6;A20.
8. Hancké B, Rhodes M, Thatcher M, editors. *Beyond varieties of capitalism: conflict, contradiction, and complementarities in the European economy*. Oxford and New York: Oxford University Press; 2007.
9. Isaacson W. *Steve Jobs*. New York, NY: Simon & Schuster; 2011.
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Belgrade, 29 December 2021

Editor-in-Chief

Dr Valentin Kuleto



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