Towards Digital Transformation of Travel Agencies: Evaluation of Determinants using Fuzzy AHP Approach

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Abstract The goal of this research was to define the priorities in implementation of digital business model in travel agencies in Serbia, as despite many advantages of digitalization, the practice was still far from expected. Research conducted was based on two previously conducted studies: 1) Four dimensions of determinants published in Digitalization in Tourism Report, that were: 1. Opportunities; 2. Difficulties; 3. Motivations and 4. Obstacles, stated as relevant for successful implementation of a digital platform in tourist agencies; 2) Identified importance of this four dimensions and their determinants through research questionnaire conducted in travel agencies in Serbia. In this paper, the most important determinants for each dimension were elements used to establish AHP hierarchy for further evaluation using Fuzzy AHP numbers. Through evaluation, the most relevant determinants and dimensions were identified as support for future strategies in digital transformation.

Keywords: digitalization, travel services, AHP, Fuzzy AHP.

University of Maribor Press

DOI https://doi.org/10.18690/978-961-286-388-3.36
ISBN 978-961-286-388-3

1 Introduction

Digital transformation is changing the way people live and work in many industries, and that is a kind of test for traditional business models. It often implies reconstructing the organization around digital operating principles, integrating traditional recourses to address new challenges, opportunities and motivations. Digital transformation strategies could be developed on different perspectives. Coming from a business-centric perspective (Matt, et al., 2015), these strategies focus on the transformation of products (services), processes, and organizational aspects owing to new technologies. Service innovation in modern economy requires a wide range of technological expertise that is above the expertise level of service providers. Therefore, the innovations increasingly imply connections, linkages and cooperation of several organizations in different stages of the new service development process (Marinković, 2012). Digitalization is important for B2C, but for B2B sector as well. According to Bughin et al, (2018) more B2B companies had digitized their core offerings and operations over the past three years than had B2C players. Digitalization enabled lowering the costs and improving the reach and quality of their offerings.

2 Travel Agencies and Digitalization

Travel services and travel agencies are developing their business models in order to respond to the challenges of digitalization. At the same time, travel organizations face cultural differences in many aspects, as national cultures have a significant impact on management, business model development, and adoption of technologies (Perelygina, et al, 2018). The importance of introducing information and communication technologies has long been recognized in the practice of tourism services in Serbia, but the development of platforms to support them has largely lagged behind. Many changes are present in travel services nowadays, and evolution of m-commerce and more social networks' applications are expected in the future. The changes are not important only for communication with clients and customers, i.e. B2C business models, but also for communication between organizations and transactions in travel industry.

2.1 Digital platform introduction

Digital platform Cofer that is a complex solution for companies that organize, offer and sell tourism services in Serbia and in the region (Figure 1). Development of this platform was a collaborative process bringing together the knowledge of experts from tourism and software engineers. Previously published research used case study approach to identified challenges that need to be overcome in order to move to the digital business model (Marinković & Marinković, 2019): 1. Unlike hotel bookings, price calculations for the sale of the arrangement were much more complicated as many specific cases need to be addressed; 2. The capacity, accommodation and transport data had to be stored in parallel; 3. It was necessary to automatically generate all threatening documentation, including contracts / legal documentation as well as operational documentation; 4. It was necessary to make it easy to search for package deals according to different parameters (type of accommodation, type of transportation); 5. It was important to provide an efficient business and trading model between travel agencies. During implementation in more than 30 agencies in Serbia (Figure 2), most of these challenges have been overcome, but implementation was still far from expected. The new challenge was to identify relevant determinants for implementation of a digital business model in order to improve its effectiveness.

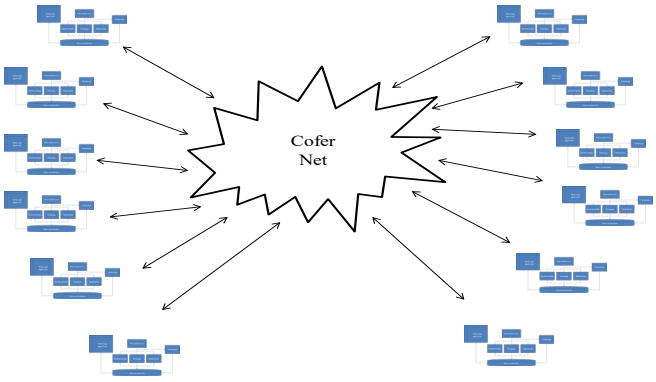

Figure 1: Cofer net topology.
Source: Own.

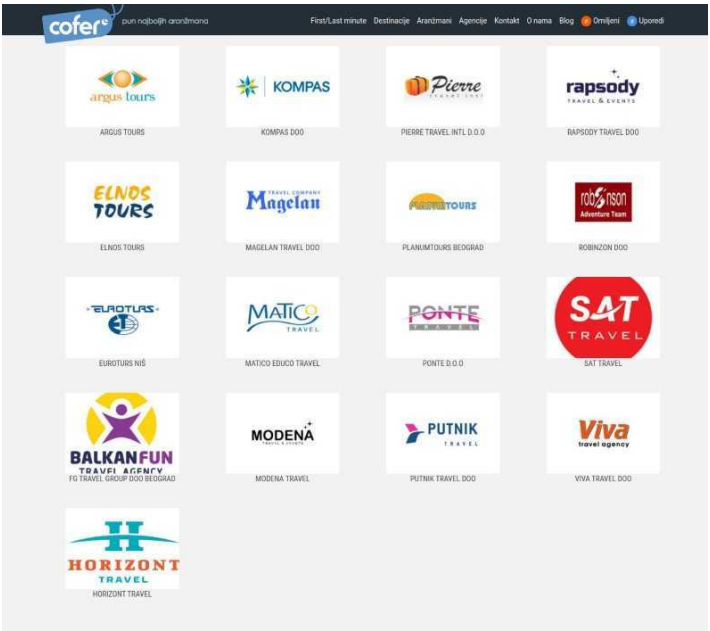

Figure 2: Travel agencies using Cofer platform.
Source: https://cofer.travel/agencies.

2.2 Dimensions and determinants of digitalization

Digitalization in Tourism Report (Dredge, et. al, 2018) identified four dimensions of determinants for successful implementation of digitalization in SMEs: 1. Opportunities – expected from digital technologies on SMEs operations; 2. Difficulties in implementing digital technologies; 3. Motivations - why SMEs seek to digitalize and 4. Obstacles in further implementing digital technologies. In our previous work (Marinković, 2020) we tested these four dimensions through research questionnaire conducted in travel agencies in Serbia. Thirty (30) employees with minimum 5 years of experience were asked to participate in the research study, and twenty three (23) took part in it, resulting in the participation rate of 76.67%. The average importance rating, standard deviation and percentage level of importance for each evaluated determinant were obtained using statistical calculation (Table 1).

Table 1: Evaluation of determinants by respondents from travel agencies in Serbia

The most significant determinants in introducing digital business model in tourism evaluated from 1 to 5	**Average value (tn)**
Opportunities expected from digital technologies	
Acquisition of valuable customers	**4.21**
Improve online brand visibility	**4.38**
Expand international reach	3.71
Improve service quality	4.17
Increase visitor satisfaction	4.04
Difficulties in implementing digital technologies	
Training on new digital technology	3.25
Cost and uncertain return on benefits	3.39
Insufficient knowledge to identify opportunities	**3.88**
Insufficient technical knowledge	**3.71**
Lack of suitable "off the shelf" products within budget	3.63
Motivations why agencies seek to digitalize	
Improving online presence for competitiveness	**4.54**
Improving growth	**4.33**
Optimistic about future opportunities	3.79
Addressing seasonality	3.54
Improving networks	4.04
Obstacles in further implementing digital technologies	
Lack of finance	**3.58**
Current technology level is sufficient	3.13
High training costs	3.08
Rapid pace of technological change	**3.67**
Cost of high-speed broadband	2.42

Source: Marinković, 2020

Research results show that opportunities that are expected from digitalization by employees of travel agencies are: to improve online brand visibility (4.38), customer acquisition (4.21), and improved service quality (4.17). Expanding international reach has the lowest importance in this group. When evaluating difficulties in implementing digital technologies, according to respondents, emphasis is on insufficient knowledge to identify opportunities (3.88), and insufficient technical

knowledge (3.71). As motivation determinants in agencies, respondents recognize improving online presence for competitiveness (4.54) as the most important, as well as improving growth and networks (4.33, 4.04). At the end, the main obstacles recognized by respondents were rapid pace of technological change (3.67) and lack of finance (3.58). They do not think that training costs are important obstacle and the lowest importance is given to costs of high-speed broadband. Eight significant determinants within four dimensions were further evaluated through AHP decision-making method to prioritize them toward the implementation of digital business model in travel agencies.

2.3 Evaluating the determinants using AHP method

The most relevant determinants previously selected, were further evaluated to define priority in digital model implementation. As it was a multi criteria decision making problem, the Analytical Hierarchy Process (AHP) was used to define hierarchy of criteria and alternatives. AHP method is one of the best-known and most commonly used methods of multiple criteria decision making. It is a comprehensive and logical framework, designed to choose the best from a given alternatives evaluated in regard to defined criteria, by allowing decision-makers to structure the complicated problems in a hierarchical model that encompasses the main goal, criteria, sub-criteria, alternatives and the relationship among them (De Felice and Petrillo 2010; Krishnan et al. 2012). It's popularity is mostly thanks to the fact that it is very close to the method in which an individual intuitively solves complex problems by decomposing them to more simple ones (Petković, et al., 2012).

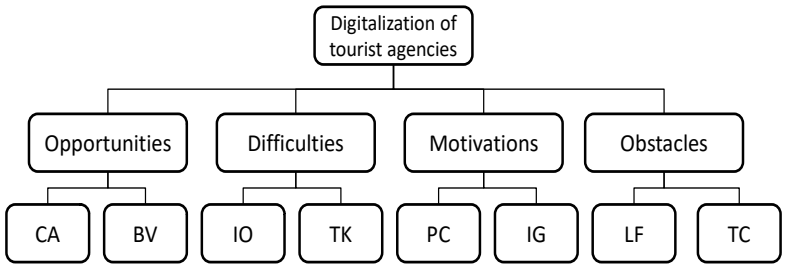

Figure 3: AHP model.
Source: Own.

The AHP hierarchy (Figure 3) represent four dimensions: opportunities, difficulties, motivations and obstacles in digital model implementation as evaluation criteria. Eight alternatives are determinants recognised as the most relevant in the previous research: CA – customer acquisition, BV - brand visibility, IO – identifying opportunities, TK – technical knowledge, PC – improving online presence for competitiveness, IG – improving growth, LF- lack of finance, TC- rapid pace of technological change.

Prioritization procedure in AHP method implies the comparison of elements (two by two) in regard to other elements at the same level and in regard to elements of the upper level of the hierarchy. The comparison is done by answering two questions by experts from IT and tourism sector: "which is more important" and "by how much", using the Saaty's scale of evaluation. The goal was to define the priorities in implementation of digital model in travel agencies, as despite its many advantages, it was still far from expected.

Table 2: Evaluation and priority of dimensions and determinants

Dimensions	OP DI MO OB	$\begin{bmatrix} 1 & 3 & 1 & 6 \\ 0.33 & 1 & 0.17 & 1 \\ 1 & 6 & 1 & 6 \\ 0.17 & 1 & 0.17 & 1 \end{bmatrix}$	The final priority: **MO-OP-DI-OB** 0.4504-0.3822-0.0917-0.0757
OP	DC OV	$\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$	The final order under criterion OP is: **DC-OV or OV-DC** 0.50-0.50
DI	NZ NTZ	$\begin{bmatrix} 1 & 7 \\ 0.14 & 1 \end{bmatrix}$	The final order under criterion DI is: **IO - TK** 0.8761-0.1239
MO	PC IG	$\begin{bmatrix} 1 & 0.25 \\ 4 & 1 \end{bmatrix}$	The final order under criterion MO is: **IG-PC** 0.80-0.20
OB	LF TC	$\begin{bmatrix} 1 & 7 \\ 0.14 & 1 \end{bmatrix}$	The final order under criterion OB is: **LF –TC** 0.8761-0.1239

The highest rank upon the completion of calculation by using AHP method is given to dimension Motivation for which the value of the importance number equals 0.4504. With respect to given comparison matrices, the final rank of the determinants is as follows:

MO-OP-DI-OB.

Table 3: Summarized priorities of the dimensions and determinants by applying AHP

Dimensions	Priority vector by AHP	Determinants	Priority vestor by AHP	Final values	Final rank
Opportunities	**0.3822**	**CA - Acquisition of valuable customers**	0.1911	**0.0730**	**(2)**
		BV - Improve online brand visibility	0.1911	**0.0730**	**(3)**
Difficulties	**0.0917**	**IO - Insufficient knowledge to identify opportunities**	0.0803	0.0074	**(5)**
		TK - Insufficient technical knowledge	0.0114	0.0010	**(7)**
Motivations	**0.4504**	**PC - Improving online presence for competitiveness**	0.0901	0.0406	**(4)**
		IG - Improving growth	0.3603	**0.1623**	**(1)**
Obstacles	**0.0757**	**LF - Lack of finance**	0.0663	0.0050	**(6)**
		TC - Rapid pace of technological change	0.0094	0.0007	**(8)**

2.4 Evaluating the determinants using Fuzzy AHP method

Fuzzy AHP method represents the elaboration of a standard AHP method into fuzzy domain by using fuzzy numbers for calculating instead of real numbers. The application of fuzzy numbers gives more flexibility to the method and allows for imprecision and mistakes while evaluating criteria and alternatives. Fuzzy model in this paper is built on basis of AHP method, while the AHP method has also

established on the basis of the expert scoring. Figure 4 shows the comparison between two fuzzy numbers (Petković, et al., 2012).

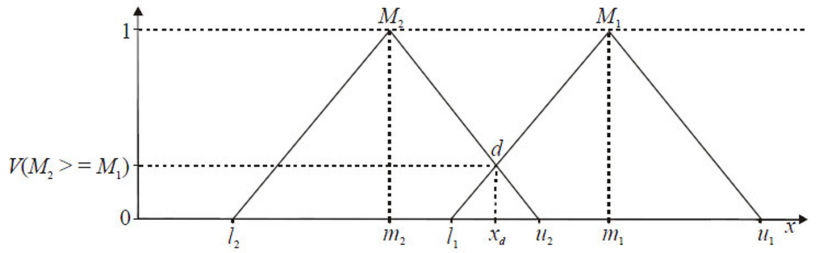

Figure 4: Comparison of two fuzzy numbers M1 and M2

Formula used for calculating the truth value of fuzzy comparison is as follows:

$$V(M2 \geq M1) = \frac{l_1 - u_2}{(m_2 - u_2) - (m_1 - l_1)}$$

The degree of possibility for a convex fuzzy number M to be greater than the number of *k* convex fuzzy numbers Mi (i = 1, 2,…, k) can be given by the use of the min operations (Petković, et al., 2012):

V(M ≥ M1, M2, …, Mk) = V[(M ≥ M1) and (M ≥ M2) and … and (M ≥ Mk)] = min V(M ≥ Mi), i = 1, 2, …, k.

Table 4: Matrix of alternatives comparison with fuzzy values

c1	a1	a2	a3
a1	(1, 1, 1)	(r12-d, r12, r12+d)	(r13-d, r13, r13+d)
a2	(1/(r21-d), 1/r21, 1/(r21+d))	(1, 1, 1)	(r23-d, r23, r23+d)
a3	(1/(r31-d), 1/r31, 1/(r31+d))	(1/(r32-d), 1/r32, 1/(r32+d))	(1, 1, 1)

In our case, the fuzzy matrix of criteria comparison is presented in Table 5.

Table 5: Fuzzy matrix of criteria comparison

$$\begin{bmatrix} (1,1,1) & (2.5,3,3.5) & (1,1,1) & (5.5,6,6.5) \\ (0.31,0.33,0.35) & (1,1,1) & (0.15,0.17,0.19) & (1,1,1) \\ (1,1,1) & (5.5,6,6.5) & (1,1,1) & (5.5,6,6.5) \\ (0.15,0.17,0.19) & (1,1,1) & (0.15,0.17,0.19) & (1,1,1) \end{bmatrix}$$

The calculation of matrices is performed the same as in the case of standard AHP method, except for using adequate operations for fuzzy numbers. Priority calculated by Fuzzy AHP is: **MO-OP-DI-OB** that confirmed priority gained with standard AHP procedure.

3 Conclusion

In order to test the determinants in travel agencies in Serbia, a research was conducted, with the objective to collect the attitudes of employees from travel agencies toward the opportunities, difficulties, motivations and obstacles, after their experience with digitalization through Cofer platform implementation. Eight significant determinants within four dimensions were further evaluated through AHP decision-making method to prioritize them toward the implementation of digital business model. Application of AHP suggests that the main determinants for successful digitalization in travel services are Motivation for improving growth with the new business model and Opportunities for acquisition of valuable customers and improve online brand visibility. These determinants should be in focus of management actions in travel agencies. According to the results, respondents do not see a rapid pace of technology change as determinant that should be in focus, and that confirm results from Silvar et al (2016) where respondents form Serbia stated that local market is underdeveloped and therefore it shuld not be invested much in innovation. The application of Fuzzy AHP method allows for additional treatment of imprecision and mistakes during the experts' estimates. Implementation of Fuzzy AHP confirmed priority gained through AHP method. The findings and conclusions of this research add to the literature in the field of developing digital business models in tourism and set an example for practitioners working on introducing innovative platforms in services.

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DIGITALNA PREOBRAZBA SLOVENIJE V ZADNJIH LETIH

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Povzetek Digitalna tehnologija prinaša vrsto prednosti, med drugim vpliva na gospodarsko rast in razvoj, produktivnost podjetij v vseh panogah in na kakovost življenja ljudi. Ne glede na potencial, ki ga prinaša, pa se nivo uporabe med državami močno razlikuje. Evropska komisija uporablja za merjenje in primerjavo digitalne preobrazbe članic Evropske Unije Indeks digitalnega gospodarstva in družbe. Kazalniki indeksa digitalnega gospodarstva in družbe se spremljajo od leta 2014. Kljub temu, da je Slovenija leta 2016 sprejela strategijo Digitalna Slovenija 2020 in jo leta 2018 dopolnila z dodatkom k načrtu uvajanja omrežij naslednje generacije do 2020, se še vedno nahaja nekoliko pod povprečjem Evropske Unije. Da bi ugotovili v kakšni meri sta sprejetje in dopolnitev strategije Digitalna Slovenija 2020 vplivali na kazalnike digitalnega gospodarstva in družbe, smo na osnovi analize sekundarno dostopnih podatkov prikazali gibanje teh kazalnikov v zadnjih šestih letih.

Ključne besede: digitalna preobrazba Slovenije, indeks digitalnega gospodarstva in družbe.

Univerzitetna založba Univerze v Mariboru

DOI https://doi.org/10.18690/978-961-286-388-3.37
ISBN 978-961-286-388-3

1 Uvod

Digitalne tehnologije vplivajo na gospodarsko rast in razvoj, produktivnost podjetij v vseh panogah, izboljšujejo pa tudi kakovost življenja ljudi (Barefoot, Curtis, Jolliff, Nicholson, & Omohundro, 2018). Z digitalno tehnologije so podprte tudi druge storitve, kot npr. izobraževanje, zdravstveno varstvo in storitve javne uprave (Mergel, Kattel, Lember, & McBride, 2018). Poudarek pa je tudi na izkoriščanju digitalnih tehnologij za izboljšanje množičnih storitev, kot so javni prevoz ter oskrba z elektro energijo, komunalnimi storitvami, telekomunikacijo, itd. (Chaaben & Mansouri, 2017). Ne glede na to, kakšen potencial predstavljajo digitalne tehnologije, pa so z njimi povezani številni izzivi (Pelletier & Cloutier, 2019; Wright, Nambisan, & Feldman, 2019). Eden izmed pomembnejših izzivov je razvoj in nastajanje novih digitalnih tehnologij, ki narekujejo nove smernice in pristope (Deursen & Mossberger, 2018). Pri tem je pomembno, da tako podjetja, kot tudi javna uprava in posamezniki sledijo razvoju digitalnih tehnologij in pri svojem delu in vsakodnevnih aktivnostih uporabljajo tiste digitalne tehnologije, ki dvigajo njihovo produktivnost.

Rezultat osebnih, družbenih in poslovnih aktivnostih na različnih digitalnih platformah so masovni podatki (Sarker, Wu, & Hossin, 2018). Prenos podatkov na globalni ravni močno narašča. Leta 1992 so beležili 100 gigabajtov (GB) na dan, v letu 2017 že 45.000 GB na sekundo, projekcija za leto 2020 pa je 150.700 GB na sekundo (UNCTAD, 2019). Na to predvsem vplivajo novi uporabniki interneta in večje izkoriščanje interneta stvari. Digitalne platforme torej omogočajo sodelovanje na spletu med različnimi deležniki pri čemer nastaja ogromno število podatkov. V grobem razdelimo platforme med transakcijske (npr. Amazon, Aliababa, Facebook, eBay, Uber in Airbnb) in inovacijske (npr. Microsoft, Oracle, Salesforce) (Nichol, 2016). Te platforme postajajo pomemben del digitalne infrastrukture podjetij, nekatere so primerne tudi za osebno rabo.

Kljub temu, da digitalne tehnologije prinašajo vrsto prednosti, pa se nivo uporabe med državami močno razlikuje. Afrika in Južna Amerika beležita zelo nizko uporabo digitalnih tehnologij, medtem ko sta Združene države Amerike in Kitajska vodilni pri izkoriščanju potenciala digitalne tehnologije. Tudi Evropska Unija opazno zaostaja za Ameriko in Kitajsko (UNCTAD, 2019), vendar pa skuša s svojimi direktivami in iniciativami zmanjšati razliko. Pri tem si pomaga z indeksom digitalnega gospodarstva in družbe (DESI) (European Commission, 2019). DESI

indeks pomaga tudi zakonodajnim organom in drugim deležnikom v posameznih državah Evropske Unije, da se lažje pripravijo na spremembe, ki jih prinaša digitalne tehnologije.

Na področju merjenja digitalne ekonomije obstajajo različne metrike (Kotarba, 2017). Ker ni nekega enotnega načina zbiranja podatkov, je primerjava med državami omejena na določene statistične podatke, ki še zdaleč ne predstavljajo vseh gradnikov digitalne ekonomije. Zato se nekatere organizacije, kot so npr. OECD in Evropska komisija, zavzemajo za bolj poenoteno merjenje. Skupina dvajsetih (kratica G20 po angleškem: Group of Twenty) je skupaj z Organizacijo za gospodarsko sodelovanje in razvoj (kratica OECD po angleškem: Organisation for Economic Co-operation and Development) in drugimi mednarodnimi organizacijami razvil orodje za merjenje digitalne ekonomije. Podobno je naredila Evropska komisija, ki je za merjenje uspešnosti držav Evropske unije na področju digitalne tehnologije uvedla DESI indeks (UNCTAD, 2019).

Evropska komisija ugotavlja, da tudi med državami Evropske Unije prihaja do velikih razlik. Med vodilnimi so skandinavske države, medtem ko je Slovenija nekoliko pod evropskih povprečjem (European Commission, 2019). Da bi izboljšali stanje v Sloveniji je Slovenija leta 2016 sprejela strategijo Digitalna Slovenija 2020 – Strategija informacijske družbe do 2020, ki določa ključne strateške in razvojne usmeritve na tem področju. Ta strategija je bila 2018 deležna dopolnitev, predvsem v smeri uvajanja omrežij nove generacije do 2020. Kljub vsem naporom pa je Slovenija še vedno pod Evropskih povprečjem. Zanima nas, kako so se kazalniki DESI indeksa spreminjali v Sloveniji skozi leta in v kakšni meri sta sprejetje in dopolnitev strategije vplivali na te kazalnike.

2 Metodologija

Za potrebe te raziskave smo uporabili sekundarne podatke o digitalizaciji evropskih držav (DESI) (European Commission, 2019), ki jih zbira Evropska komisija. S pomočjo DESI indeksa se na nazoren in razumljiv način spremlja relativni zaostanek ali napredek evropskih držav. Za posamezno državo so na voljo podatki od leta 2014 naprej. Osredotočili smo se na Slovenijo in njen zaostanek oz. napredek v zadnjih šestih letih.

DESI indeks je sestavljen iz petih kategorij: povezljivost, človeški viri, uporaba internetnih storitev, integracija digitalnih tehnologij in digitalnih javnih storitev. Skupni DESI indeks je izračunan s pomočjo uteži, kjer sta najvplivnejši kategoriji povezljivost in človeški viri z utežjo 25%, sledi kategorija integracija digitalnih tehnologij z utežjo 20% in kategoriji uporaba internetnih storitev in digitalne javne storitve z utežjo 15%. Tabela 1 predstavlja uteži podkategorij znotraj posameznih kategorij.

Tabela 1: Uteži podkategorij znotraj posamezne kategorije

Kategorija	**Podkategorija**	**Utež**
Povezljivost	Fiksna širokopasovna povezava	18,5%
	Mobilna širokopasovna povezava	35%
	Hitra širokopasovna povezava	18,5%
	Ultra hitra širokopasovna povezava	18,5%
	Indeks cen širokopasovne povezave	9,5%
Človeški viri	Internetne uporabniške izkušnje	50%
	Napredne spretnosti in razvoj	50%
Uporaba internetnih storitev	Uporaba interneta	25%
	Spletne aktivnosti	50%
	Transakcije	25%
Integracije digitalnih tehnologij	Digitalizacija poslovanja	60%
	E-trgovina	40%
Digitalne javne storitve	E-uprava	80%
	E-zdravje	20%

V kategorijah človeški viri in uporaba internetnih storitev je bilo skozi leta zaznati zaostanek v primerjavi s predhodnimi leti, zato so v Tabeli 2 prikazane še uteži indeksov za podkategorije omenjenih kategorij.

Tabela 2: Uteži indeksov podkategorij v kategorijah človeški viri in uporaba internetnih storitev

Kategorija	Podkategorija	Indeks	Utež
Človeški viri	Internetne uporabniške spretnosti	Vsaj osnovne digitalne spretnosti	33%
		Nad osnovnimi digitalnimi spretnostmi	33%
		Vsaj osnovna programska znanja	33%
	Napredne spretnosti in razvoj	IKT specialisti	33%
		IKT specialistke	33%
		Diplomanti s področja IKT	33%
Uporaba internetnih storitev	Uporaba interneta	Ljudje, ki niso nikoli uporabili interneta	50%
		Internetni uporabniki	50%
	Spletne aktivnosti	Novice	12,5%
		Glasba, video posnetki in igre	12,5%
		Video na zahtevo	12,5%
		Video klici	12,5%
		Družbena omrežja	12,5%
		Profesionalna družbene omrežja	12,5%
		Spletni tečaj	12,5%
		Spletno svetovanje in glasovanje	12,5%
	Transakcije	Bančništvo	33%
		Nakupovanje	33%
		Spletna prodaja	33%

Potrebno je omeniti, da so podatki za kategorije in podkategorije podani z utežnimi vrednostmi, medtem ko so za posamezne indekse podani deleži. Poleg tega so nekatere indekse, npr. osnovne računalniške spretnosti, začeli spremljati kasneje, zato pri analizo niso bili na voljo vsi podatki za vsa obravnavana leta.

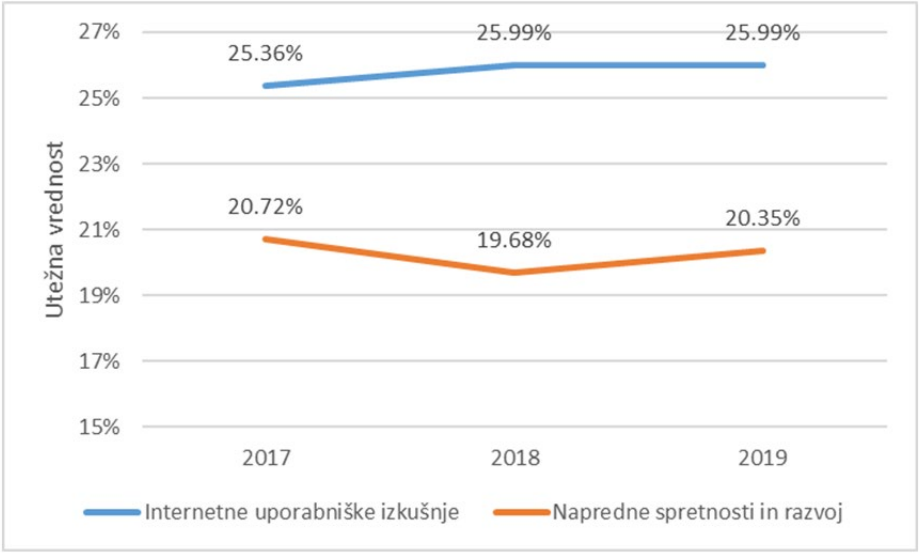
3 Rezultati

Tabela 3 prikazuje primerjavo posameznih kategorij DESI indeksa za Slovenijo med leti 2014 in 2019. S tabele je razvidna stalna rast v kategorijah povezljivost, integracija digitalnih tehnologij in digitalnih javnih storitev, medtem ko je v kategorijah človeški viri in uporaba internetnih storitev zaznati nihanja. V nadaljevanju se bomo osredotočili na kategoriji, kjer so bila zaznana nihanja.

Tabela 3: Primerjava posameznih kategorij DESI indeksa za Slovenijo med leti 2014 in 2019

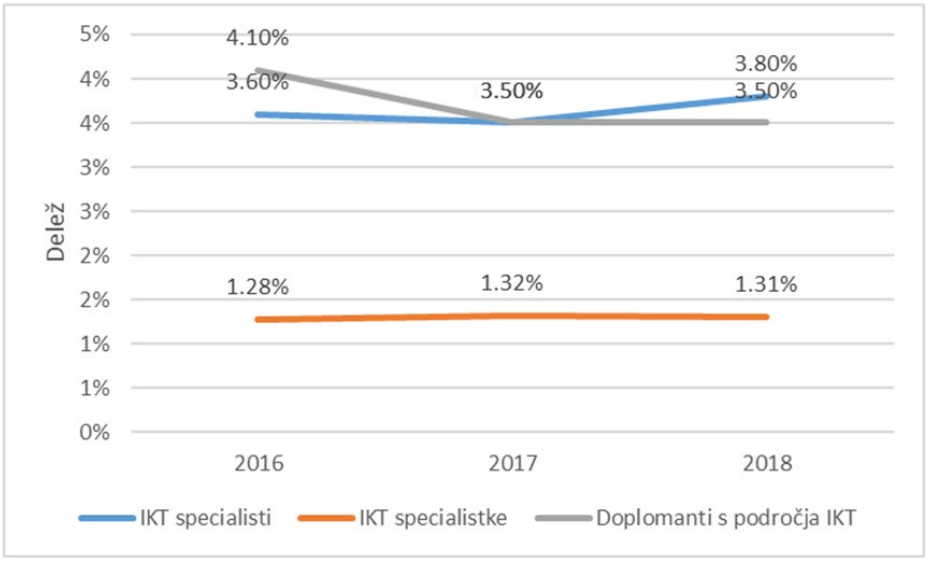
Osnovni pokazatelji (kategorije)	**Utež**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Povezljivost	25%	10.05%	10.87%	11.9%	12.73%	13.35%	14.63%
Človeški viri	25%	10.20%	10.41%	10.71%	11.52%	**11.42%**	11.58%
Uporaba internetnih storitev	15%	6.17%	6.22%	**4.77%**	**5.60%**	6.66%	6.70%
Integracija digitalnih tehnologij	20%	5.16%	5.68%	7.15%	7.40%	7.89%	8.02%
Digitalne javne storitve	15%	5.30%	5.93%	6.92%	7.47%	8.56%	9.71%

V kategoriji človeški viri je bil zaznan upad rasti v letu 2018. Slika 1 prikazuje primerjavo podkategorij kategorije človeški viri med leti 2017 in 2019. Vidimo, da je razlog za upad povezan z nižjo oceno naprednih spretnosti in razvoja.



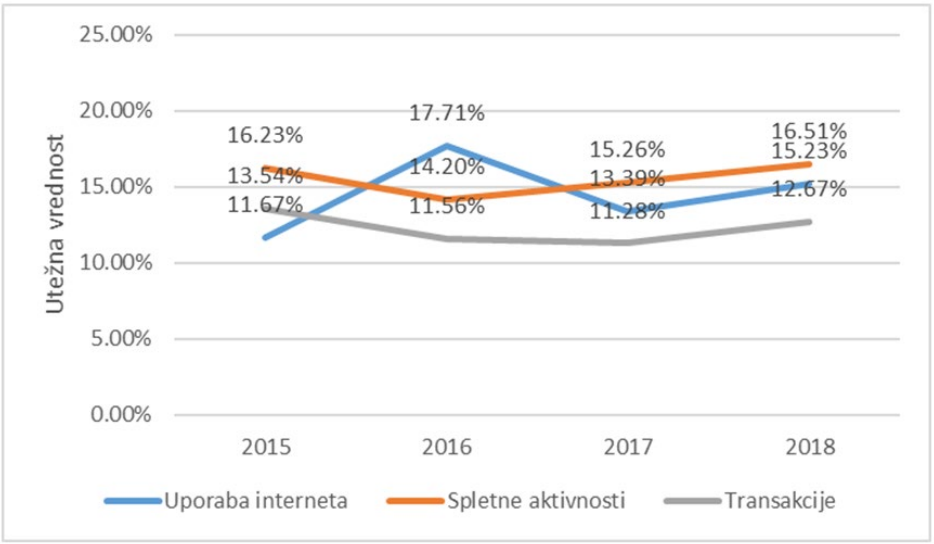
Slika 1: Primerjava podkategorij človeški viri med leti 2017 in 2019

Če podkategorijo napredne spretnosti in razvoj pogledamo bolj detajlno (Slika 2), lahko vidimo, da na nižjo utežno vrednost v letu 2018 najbolj vplival delež diplomantov na področju IKT. Leta 2017 je na tem področju diplomiralo 4,1% študentov, v letu 2018 pa 3,5% študentov.



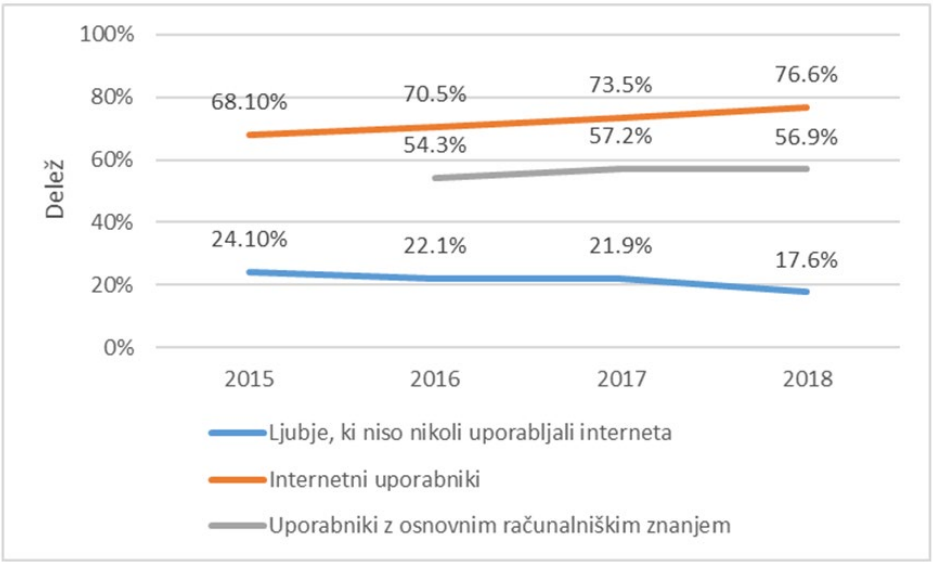
Slika 2: Primerjava indikatorjev podkategorije napredne spretnosti med leti 2017 in 2019

V kategoriji uporaba internetnih storitev je bilo zaznati upad rasti v letih 2016 in 2017. Slika 3 prikazuje primerjavo podkategorij kategorije uporaba internetnih storitev med leti 2015 in 2018. Vidimo, da se je leta 2016 v primerjavi z letom 2015 povečala utežna vrednost uporabe interneta, zmanjšala pa utežna vrednost spletnih aktivnosti in transakcij. V letu 2017 se je drastično zmanjšal utežna vrednost uporabe interneta, zaznan je bil tudi manjši upad utežne vrednosti transakcij, medtem ko se je povečala utežna vrednost spletnih aktivnosti. Od leta 2018 naprej pa se beleži napredek v vseh treh podkategorijah.



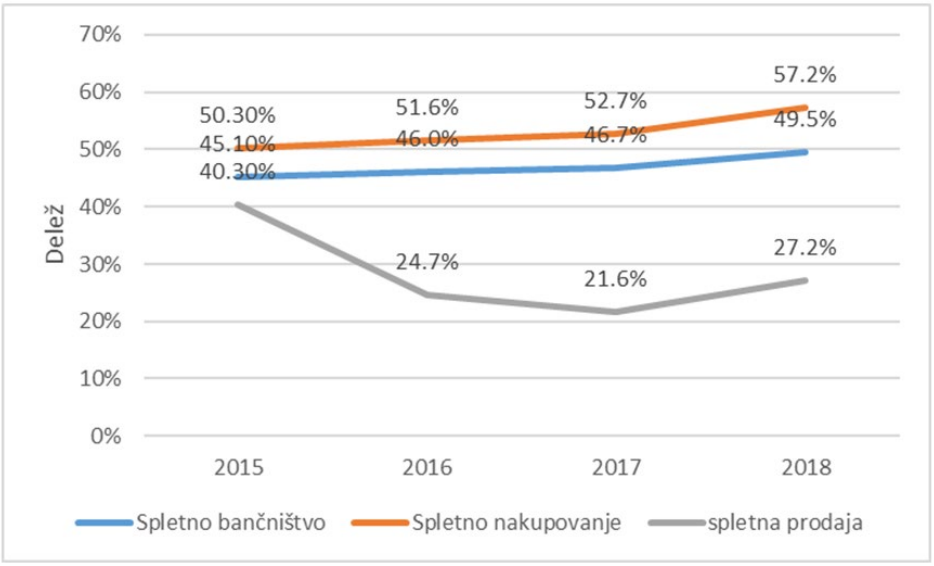
Slika 3: Primerjava podkategorij kategorije uporaba internetnih storitev med leti 2015 in 2018

V nadaljevanju so predstavljeni rezultati podkategorij uporaba interneta in transakcije, kjer je bilo zaznati največ sprememb. Slika 4 prikazuje nihanje deležev indeksov podkategorije uporaba interneta med leti 2015 in 2018. Vidimo, da se v zadnjih letih zmanjšuje delež ljudi, ki niso nikoli uporabljali interneta in povečuje delež internetnih uporabnikov, medtem ko se je delež uporabnikov z osnovnimi računalniškimi znanji med 2016 in 2017 povečal, leto 2018 beleži nekoliko nižji delež.



Slika 4: Nihanje indeksov podkategorije uporaba interneta

Slika 5 prikazuje nihanje deležev indeksov podkategorije transakcije med leti 2015 in 2018. Vidimo, da se delež spletnega bančništva in nakupovanja povečuje, medtem, ko delež spletne prodaje skozi leta niha.



Slika 5: Nihanje indeksov podkategorije transakcije

4 Razprava in zaključek

Analiza DESI podatkov, ki jih zbira Evropska komisija od leta 2014, kaže dokaj enakomeren, vendar počasen digitalni razvoj gospodarstva in družbe v Sloveniji. Kljub temu, da je bilo v letih 2016, 2017 in 2018 zaznati nihanja v kategorijah človeški viri in uporaba internetnih storitev, je bila Slovenija v vseh kategorijah DESI indeksa v letu 2019 ocenjena najboljše doslej. Podatki nakazujejo, da je na upad digitalnega razvoja v nekaterih kategorijah vplivala tudi strategija Digitalna Slovenija 2020, ki je bila vzpostavljena leta 2016. Nadalje podatki nakazujejo, da je bila dopolnitev strategije leta 2018 uspešna, saj se je stanje v Sloveniji na področju digitalne preobrazbe izboljšalo. Vendar pa je potrebno opozoriti, da se Slovenija po DESI indeksu za leto 2019 uvršča na 16. mesto med 28 državami Evropske Unije in da bo za uvrstitev v prvo tretjino držav Evropske Unije v vseh petih kategorijah DESI indeksa, potrebno dopolniti kohezijsko politiko Slovenije na področju digitalizacije.

Analiza posameznih indeksov kaže največja nihanja v podkategorijah napredne spretnosti in razvoj, uporaba interneta in transakcije. V podkategoriji napredne spretnosti in razvoj podatki kažejo, da se zmanjšuje delež diplomantov na področju

IKT. V Sloveniji v zadnjih letih beležimo upad deleža študentov, kar se lahko odraža tudi na številu diplomantov na področju IKT. V podkategoriji uporaba interneta pa podatki kažejo manjši upad deleža uporabnikov z osnovnimi računalniškimi znanji, v podkategoriji transakcije pa se skozi leta beleži nihanje deleža spletne prodaje. Presenetljiv je predvsem podatek o manjšem deležu uporabnikov z osnovnimi računalniškimi znanj, saj so osnovna računalniška znanja del učnih načrtov osnovnih in srednjih šol. Morda bi lahko ta rezultat povezali z hitrim razvojem področja, ki mu starejše prebivalstvo ne more slediti in zaradi tega menijo, da nimajo niti osnovnega računalniškega znanja. Medtem ko je nihanje deleža spletne prodaje lahko povezano z nastajanjem in izginjanjem podjetij.

Kljub temu, da je DESI eden izmed bolj poznanih indeksov za spremljanja razvoja na področju digitalne transformacije, pa ta ne zajema vseh indikatorjev digitalne transformacije. Zato bi morali pri primerjavi Slovenije z drugimi članicami Evropske Unije in spremljanju digitalne transformacije skozi leta zajeti tudi druge indikatorje npr. inovacijski indeks držav, kazalec sposobnosti inoviranja v gospodarstvu. S tem bi pridobili bolj celostno sliko glede stanja na področju digitalne transformacije..

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