Acta Catallactics

časopis za ekonomska i opšta društvena pitanja

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Iskreno se nadamo da će se časopis ostvariti vlastitu misiju i doprinjeti boljem razumijevanju ekonomskih i opštih društvenih pitanja.

Svako dobro,
Admir Čavalić, MA,
glavni i odgovorni urednik

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Sadržaj

CURRENT (INTERNATIONAL) FINANCIAL SYSTEM: TECHNOLOGY EFFECTS AND FUTURE PERSPECTIVES[1]

Pavle Jakovac, PhD [2]

Abstract

This paper aims to show the wider picture of the impact of technology on international finance. It discusses about technologies, which have had an influence on the current financial system. As technology is evolving, we are getting more and more interesting services in international finance. Since there are more transactions and payments, it is necessary to tackle the problems such as scalability, speed and risks of hacking attacks, as well as the problem of having a centralized system. This paper also gives a perspective on how the future of international finance will develop. Examples and explanations of technologies which will have impact on future financial system are further discussed, as well as who will likely try to solve current problems in international finance.

Key words: international finance, technology, innovation, (de)centralized system(s), perspectives

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Trenutni (međunarodni) financijski sustav: tehnološki učinci i buduće perspektive[3]

Sažetak

Ovaj rad ima za cilj prikazati širu sliku utjecaja tehnologije na međunarodne financije. U radu se raspravlja o tehnologijama koje su imale utjecaja na sadašnji financijski sustav. Kako se tehnologija razvija(la), dobivamo sve zanimljivije usluge u međunarodnim financijama. Budući da postoji sve više transakcija i plaćanja, potrebno je dotaknuti se problema poput skalabilnosti, brzine i rizika od hakerskih napada, kao i problema centraliziranog sustava. Ovaj rad daje perspektivu o tome kako će se u budućnosti razvijati međunarodne financije. Dalje se razmatraju primjeri i objašnjenja tehnologija koje će imati utjecaj na budući financijski sustav, kao i tko će vjerojatno pokušati riješiti trenutne probleme u međunarodnim financijama.

Ključne riječi: međunarodne financije, tehnologija, inovacije, (de)centralizirani sustav(i), perspektive

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1. Introduction

We are approaching an exciting period in the modern history of money. Quick speeding up of innovations is empowering an essential re-examination of the monetary structure, while at the same time welcoming new contenders with the possibility to overturn the customary business requests. There is a vast amount of changes coming into financial sector so quickly that it very well may be hard to follow the section of new contenders, the ascent of new action plans and the uses of new advancements to the matter of budgetary administrations. New research, constant changes, and innovation are something individual, institutions and firms can only adapt to by education in order to stay competitive on the market.

Additionally, fast developments in the capacity and openness of computational force, information and systems of computerized network, have constrained a difference in both the centre precepts of seriousness and the operational structure for each industry, fabricating a large group of events for organizations and their clients, new difficulties and the policymakers answerable for overseeing them (Arslanian, Fischer, 2019). Successful multinational companies and institutions already recognized it as they are constantly hiring new employees with a good combination of technological and economical knowledge. There are many small start-ups, which large companies have supported just to keep up with all the coming changes and innovations. Many companies, which do not even have special connections with finance, are creating separate departments for financial technology.

The aim of this paper, in general, is to tackle the territories of advancement that are ready to affect the state of the money related financial services ecosystem. With new crypto-assets and the rise of new technologies (i.e., artificial intelligence - AI and Internet of Things - IoT), the financial technology revolution is happening as we speak. Therefore, the paper is organized in the following manner. After introductory observations, Section 2 presents the role and impact of technology on the current financial system while Section 3 describes the future perspectives. The final section closes with conclusions.

2. The role and impact of technology

2.1. Online exchanges

In basic words, e-banking suggests an arrangement of banking items and administrations through electronic conveyance channels. E-banking is an electronic instalment framework that licenses clients of an establishment to lead money related exchange on a website worked by the organization, similar to a retail bank, virtual bank, store monetary foundation or reserve funds and credit. Online banking is also called internet banking, web-based banking, and virtual banking. It encourages basic access to accounts, business exchanges, accepting brief data on money related items and administrations, including getting data on versatile handsets. Enormous advancement inside the field of information innovation has rendered globalization of items and administrations inside the finan-

cial framework. Present-day banking has gone past every topographical obstruction. The utilization of innovation inside the financial area has transformed the financial situation around the world. Because of the straightforwardness of the market, customers can analyse the administrations of arranged banks all the more effectively. If clients don't seem, by all accounts, to be happy for the things, expenses, or organizations offered by a chosen bank, they are set up to change their budgetary associate ideally more successfully over inside the physical or certified bank-client relationship. From the banks' point of view, usage of the net has diminished the physical costs of banking undertakings. Progress in information development has reduced the expenses of planning information, while the net has energized its transmission, along these lines empowering change inside the very pith of the money related business. Around the world, electronic monetary organizations, whether or not passed on the web or through various instruments, have spread quickly recently (Popper, 2016).

Online banking permits a client to lead money related exchanges using the net. Web-based banking is moreover called online banking or web banking. Internet banking offers clients pretty much every help customarily accessible through a local office including stores, moves, and online bill instalments. Each financial establishment has a type of web-based banking, accessible both on work area forms and through versatile applications. With web-based banking, purchasers are not required to go to a bank office to complete the majority of their fundamental banking transactions. They will do all of this at their convenience, wherever they want - at home, at work, or on the go (Bernstein, 2013).

Online banking requires a PC or other gadget, an online connection, and a bank or positive recognizable proof. To get to the administration, customers must enlist for their bank's web-based financial assistance. To register, they need to make a secret password. When that is done, they can utilize the support to do all their banking. Banking transactions offered online change by the foundation. Most banks commonly offer essential administrations, for example, moves and bill instalments. A few banks additionally permit clients to open up new records and apply for credit cards through internet banking websites. Other functions may incorporate requesting checks, putting stop payments on checks, or announcing a change in address. Checks would now be able to be stored online through a versatile application. The client just enters the sum before snapping a picture of the front and back of the check to complete the deposit (Brown, 2016).

Convenience is a significant preferred position in internet banking. Fundamental financial transactions, for example, taking care of tabs and moving assets between records should handily be possible 24 hours per day, seven days every week, any place a buyer wishes. Web-based banking is quick and effective. Funds can be moved between accounts in a split second, particularly if the two records are held at a similar foundation (Irrera, 2014). Purchasers can open and close a sum of various records on the web, from fixed stores to repeating store accounts that normally offer higher paces of intrigue. Consumers can also screen their records much of the time intently, permitting them to protect their records. Non-stop access to banking data gives early recognition of false movement, in this manner going about as a guardrail against budgetary harm or misfortune.

A few banks work solely online, with no physical branch. These banks handle client support by telephone, email, or online visit. Online banking is normally performed on cell phones now that Wi-Fi and 4G systems are generally accessible. It likewise should be

possible on a microcomputer. These banks probably will not give direct ATM access, but will make arrangements for customers to utilize ATMs at different banks and retail locations. They will repay purchasers for a couple of the ATM fees charged by other money related organizations (Sudhir, 2018). Diminished overhead costs identified with not having physical branches regularly permit online banks to buy (for their customers) noteworthy investment funds and to charge banking fee(s). They likewise offer higher interest fees on accounts (Allison, 2018). Noticeable online banks inside the US incorporate for example Ally Bank, Bank5 Connect, Discover Bank, Simple Bank, and Synchrony Bank (Brown, 2016).

High-tech advancements as have made online banking framework foolproof and risk-free. The challenge in e-banking is the capacity to embrace worldwide innovation(s). For instance, to this point complete relocation has not happened in many emerging nations in light of the shortage of adequate infrastructure, assets, and required specialized ability. Comprehensively, acknowledged e-payment frameworks are another such model. Numerous corporate and physical buyers in some emerging nations either do not trust or do not approach the necessary framework to prepare for the process of e-instalments. Historically, most e-finance activities in emerging nations are the consequences of agreeable endeavours between the private and open divisions. For instance, Singapore's fruitful Trade Net Framework was a government-supported task (Hertig, 2017).

If the overall population doesn't have the required way to execute the activities, it's clear that helpful endeavours among private and public sectors, along with the multilateral offices like the International Bank for Reconstruction and Development, are created to encourage open help for e-finance related activities. E-banking has made numerous new tasks for bank executives, regulatory and administrative specialists. They increased not only by the expanded possibility for cross-border exchanges, yet additionally residential exchanges bolstered innovation applications, which increased numerous security-related issues. The Electronic Banking Group (EBG) of the Basel Committee on Banking Supervision has characterized risk management principles used for electronic banking (Chohan, 2018). They spend significant time in a manner to broaden, adjust, and tailor the overarching risk-management framework to the electrical financial setting. There are some genuine consequences of global online banking. Standard contention is that low exchange costs possibly make it a lot simpler to direct cross-border e-banking. For a few banks, cross border tasks offer an opportunity to procure economies of scale (Jilian, 2018). This is why cross-border finance additionally needs the following level of cross-border oversight. Such collaboration might need to increment to comparative administrative guidelines, disclosure requirements for productivity, and blending of legitimate, accounting, and tax assessment game plans. Some countries do not have sufficiently prepared systems to confront the results of cross-border and online banking (Fruhlinger, 2017).

The other side of this technological blast is that e-banking is not just inclined to although it may fuel some of the indistinguishable dangers (i.e. administrative, legitimate, operational, and reputational) which are inherent in customary banking. Moreover, it presents new challenges. Accordingly, numerous national regulators have changed their guidelines to achieve their fundamental destinations: guaranteeing the insurance and sufficiency of the domestic banking industry, advancing business sector discipline and ensuring client rights, and the trust within the banking industry. New strategies for conducting transactions, new instruments, and new specialist organizations would force legal defini-

tion, recognition, and permission. For instance, it will be easy to provide an electronic signature and give it an identical status because of the handwritten signature. Existing lawful definitions and authorizations, concerning the legitimate meaning of a bank and the idea of a national border, must be re-evaluated. The financial industry has been a pacesetter inside the e-business in the world lately. The e-banking revolution on a very basic level has changed the matter of banking by scaling borders and achieving new opportunities. It must be noticed that while e-banking gives numerous advantages to clients and banks, it likewise exasperates customary financial dangers. Compared with developed nations, developing nations face numerous obstacles that influence the effective execution of e-banking activities. Banks ought to furnish their clients with convenience, which means offering administration through a few distribution channels (i.e. ATM, online branches) and have more capacities accessible on the internet. Different advantages are, for example, expanded product contributions and broadened geographical reach. With these advantages, banks can acquire accomplishment in the monetary market (Shields, 2017).

2.2. Cryptocurrencies and blockchain technology

To the surprise of many, the term "blockchain" is not referenced once in Satoshi's white paper. The closest Satoshi comes to mentioning blockchain is with references to "blocks are chained" or "chains of blocks". All things considered, having blocks and connecting them in a chain using cryptographic functions is the base of the Bitcoin network, and why the characteristic of blockchain is ascribed to Satoshi as well (Nakamoto, 2009).

As for the blockchain, it can most simply be described as a publicly available non-centralized ledger (e.g., financial transactions) where records are updated permanently and only once during some transactions (Yurcan, 2016). A blockchain is a digital record or chain of blocks that are encrypted by blocks. All participants in the blockchain system keep their copied books with system information, and each new event will be kept in external logs or updated in their copies of books, which will check the balance of each other after adding a new block. In this way, the whole system becomes truly decentralized, since all transactions required by all offline participants, who record events in their books, can be centralized in a system where changes or transactions would be recorded in only one ledger. You can use the blockchain system to exchange funds, different tokens, appropriate smart contracts, property rights, etc.

If you look at a centralized system like PayPal, PayPal's server is a major database hub, which means that any changes to anyone found by PayPal users with these services are recorded and stored in one or possibly several servers. Therefore, all data and information are in the central system, that is, in PayPal. It could be said that PayPal's server is the central ledger of all its users. In a centralized system, all data and information are stored on one or more central servers. While in a decentralized system, every change in data must be stored in a blockchain system of some network where all participants, such as the Ethereum network, store data within their copies of books in the chain community (Shields, 2017).

Often, with the terms blockchain and cryptocurrency, we mean the transmission of funds and transactions, but in the up-to-date information society where information and data represent a great significance. It is the blockchain that is credited with growing safety and protection of data and information, as records cannot be altered or interfered with. You can view the information in the case of an open blockchain network from any other interested user who invokes transparency (Brown, 2016). It is likewise essential to clarify that there is no single blockchain. For instance, the Bitcoin blockchain is unique compared to the Ethereum blockchain or on the other hand the NEO blockchain or the EOS blockchain (Graham, 2015).

There are various features that most blockchains have: a) decentralized and transparent[4], b) consensus-driven[5] and c) immutable[6]. However, blockchain advancement is not a panacea that will handle all the world's issues. While it has various exceptional good conditions, it moreover has a couple of disadvantages: a) anonymity[7], b) quality of information[8], c) interoperability[9], d) mass adoption[10], e) legal uncertainty[11].

Bitcoin, Ethereum, Ripple, Zcash, Litecoin, to name a few, have been common terms in newspapers and websites lately. Everything started in 2009 with the first transaction of some cryptocurrency (i.e. Bitcoin), but the real "boom" occurred in 2014 when many institutions related to the monetary system, and multinational companies started investing their money and research activities in cryptocurrencies. Many people have been wondering lately about cryptocurrencies. Is it another "Ponzi" scheme that pops us up as advertisements on various websites and portals, or is there something completely different about it?

Interestingly, the total number of bitcoins that can be traded is 21 million, which raises many questions regarding circulation and changes in the price of the most famous cryptocurrency. However, there are also non-mining cryptocurrencies based on the blockchain

4 There is no central database or central force and every member keeps up a duplicate of the record. Participants are proficient to keep an eye on any transaction that has occurred at any period on the blockchain. The degree of decentralization shifts from blockchain to blockchain (Hertig, 2017).

5 All applicants share and update the record afterward arriving at an agreement and affirming the legitimacy of transactions occurring. While valid for most key blockchains, there are different strategies for agreeing as we have seen beforehand.

6 Once data is added to the blockchain, it cannot be modified. This is done through the utilization of specific cryptographic methods as we talked about before. There are consistently exceptions from the above. Yet being decentralized, consensus-driven and immutable are attributes that are regular across most of the blockchain systems. The significant key contrast between various blockchains are whether they are public or private (Buterin, 2013).

7 One of the things that make open blockchains, for example, the Bitcoin blockchain, so remarkable is that they permit anybody to join the framework and direct exchanges. Nonetheless, while each exchange is recognizable, it is hard to tell who is behind a given development of assets.

8 While the information on a blockchain is unchanging, it doesn't imply that it is exact. A similar standard of "trash in, trash out" applies likewise with some other database (McGoogan, 2017).

9 The blockchain is still in its early stages and there are no settled industry norms for its innovation framework. Most blockchains today work in their independent universe with little interoperability with different blockchains (Duhigg, 2018).

10 Blockchain is fresh by far and endeavours are still at the start of their desire to assimilate knowledge about this technology. No tremendous endeavour may move their whole database on blockchain. This choice will take time and it will be the place people will have the alternative to coordinate trades snappier and even more beneficially, for instance, without understanding that the backend they are using is blockchain. A better than average comparability would be the way persons nowadays turn and surf on the internet without really considering the distinctive web shows working far out (Goldberg, 2005).

11 Current administrative systems and necessities (especially in profoundly controlled enterprises like monetary administrations or human services) were not drafted in light of blockchain innovation. Essential lawful ideas extending from client information insurance to later improvements in information protection necessities like the „option to be overlooked" require a definite audit in a blockchain setting (Vigna, 2017).

network. Initial cryptocurrency offers are issued tokens that users can later use to conduct transactions, store information on the blockchain, store their tokens in digital wallets, and more. These cryptocurrencies are based on Proof of Stake where there is no mining, the network is maintained by owners who have a certain amount of coins on their digital wallets, and they earn by processing transactions, and if they process a block, they receive transaction fees from that block (Buterin, 2013). Among the most well-known non-mining cryptocurrencies are Ripple, Waves, NXT, Factom, and Maidsafe.

According to the Peer-to-Peer (P2P) concept, a digital peer-to-peer cash system represents a concept of connecting computers without a central point, without a central server (central server). In this way, each computer finds and communicates directly with other computers without a central authority. Nowadays, all social activities are related to the digitized system. Organizations, institutions, and businesses are increasingly pushing for digital solutions to accelerate the processes of manufacturing, construction, administration, purchasing, sales, and communication use. Also, cryptocurrencies can further accelerate transactions conducted between two natural or legal persons and thus further digitize the system.

One of the main problems and threats of cryptocurrency against fiat money is that people keep less and less money in their bank accounts. The reason for this is the many times higher earnings on cryptocurrencies than the extremely low-interest rates for keeping money in the bank. In this way, banks make less money because less money is in circulation and thus the number of cash flows is lower. The Bank of America has complained to the US regulatory authorities about the increasing number of payments to cryptocurrency exchange accounts and the simple control of cryptocurrencies. In addition to Bank of America, JP Morgan and Citigroup and Lloyds have banned their customers from purchasing cryptocurrencies through credit cards. As a justification, it was stated that banks want to protect their customers from losing money and risky investment in cryptocurrencies.

It is up to all of us to carefully study all the information and terms of use of the cryptocurrency we are interested in. The amount of stake must be commensurate with our financial capacity. Greed and the desire for fast money often occurs. One of the important items on the official website of a particular cryptocurrency is the project's whitepaper. In this way, we can analyse in detail all the technical data, the economic calculations and the technology behind the project. It is also necessary to analyse how funds raised by investors will be used and on what things. Whether it's development, marketing, legal issues, expanding business offices, or wanting to get as many quality conferences around the world as possible, all serious initial coin offering (i.e., ICO) should have this mentioned in the investment plan. It is very important in the investment plan to check the team and advisors, their past, competencies and business success.

2.3. Prospects for everyone?

Along with this new technological advancements, there are still approximately 1.7 billion individuals around the world that remain "unbanked" – for the dominant part of those individuals absence of cash, trust and high expenses are the most compelling motivations for not having financial records. Financial avoidance is perhaps the biggest problem that is

confronting the (standard) monetary framework. According to Popper (2016), this problem is being gradually resolved with the appearance of different solutions like digital-only banks. Empowered digital financial services are gaining incredible ground in bringing this unbanked portion of the general public towards financial inclusion. Financial literacy presents also an issue. Only one in three individuals comprehend the key financial ideas, and a large portion of the money related concepts is focused inside the advanced economies, which is obvious from the skewed circulation of riches around the globe. It is almost a paradox that in a (complex) period of STEM education (i.e. (Science, Technology, Engineering and Mathematics), the main part of the population comes up short on the essential skills of private finance. Indeed, even in western schools, education about acceptable budgetary propensities, dealing with your credit score or saving is lacking. Without the right instruments and information, how can we anticipate that the population will make the right choices in regards to money matters or building fortunes? Work must be done on this front to broaden mindfulness among the majority about the formation of riches and their general financial prosperity (Alvarado, 2013).

Banking fees are another part of the equation. One would expect putting away money and transferring should be modest, quick and helpful. However, significant expenses of keeping up a financial account with much higher fee structures are demonstrably unhelpful. According to Jilian (2018), the overall normal fee is around 7% whereas the G-20 goal is 5% and the UN Sustainable objective is 3%, respectively. Fruhlinger (2017) states that financial services are the least trusted compared to different areas of the overall economy.

While there is little question that the centralized nature of this worldwide monetary framework has helped in making gigantic measures of wealth for those that had access, knowledge and network connectivity to the framework, it likewise made worldwide difficulties like inequality and lack of access to fundamental money related administrations for other people. The upside, however, is that with the multiplication of mobile phones and web access, combined with the event of decentralized technologies like blockchain, is empowering us (i.e. the other people) to completely overhaul this worldwide monetary system and replace it with a financial ecosystem which is reasonable, fair and open to everybody (Chohan, 2018).

For an internet banking client, utilizing frameworks for the first time may introduce difficulties that keep transactions from being handled, which is the reason why a few customers prefer face to face exchanges with a teller (Duhigg, 2018). Online banking does not help if a customer needs access to a lot of cash. While he/she could likewise be prepared to take a specific sum at the ATM, but since most cards incorporate a limit, visit to the bank therefore is still needed. Although internet-banking security is continually improving, such records are still vulnerable when it comes to hacking especially is customers are using open Wi-Fi systems.

If we decide to switch from the banking system to cryptocurrencies, there is a risk of hacking attacks. In June 2011, one forum user on the topic of cryptocurrency mining said that he had traded as many as 25,000 Bitcoins. When their value went up, one day he woke up and realized that he is "missing" around half a million dollars' worth of bitcoins due to the malware that the hackers were able to install on this user's computer (Fruhlinger, 2017). And, according to Hertig (2017), Bernstein (2013), and Allison (2018), the (serious) hacker attacks continued (i.e., in Japan, Slovenia, Hong Kong, etc.).

3. What the (near) future holds for the (international) financial system?

3.1. Introduction to new technologies

The turning point for the demand of (new) financial technology was the global financial crisis that occurred in 2008. People's lack of thrust and anger in the banking system was the perfect ground for the financial improvement. In this favourable landscape, fintech providers emerged, offering innovative and different services at lower prices, through mobile apps or well-designed platforms. There are many interesting new technologies, but we will present some of them, which are considered as most influential for future changes in the financial world:

a) Neo-Banking

The neo-banks, also called start-up banks or digital-only banks have in-built vision and aim to reach customers through digital omni channels. Neo-banks offer banking services in a less complicated way and with a cost advantage as compared to the traditional banks. Neo-banks are attracting customers in real time with their cheaper and better offerings to the tech generations. These banks are a very promising avenue for reaching more and more customers through innovative business models and digital channels (Nicoletti, 2017).

b) Big Data Analysis

Big data analysis helps in finding new techniques for making business and reduce costs. Applying big data analysis implies better decision-making procedures in terms of both time and quality (i.e., decision-makers have the chance to analyse new sources of data in a quicker way). Big data analysis can also be helpful in cross-selling and risk management. Using data mining and analysing, there are few ways for the financial services industry to attain business advantages. Many fintech companies also are leveraging on big data to produce more customer-focused and intuitive services as well as to accomplish business advantages. These contain enhanced detection of fraud, retail customer service, and development of operational efficiencies. Predictive analysis of both internal and external data results in good, proactive management of a wide-ranging problem from credit and operational risk to customer loyalty and profitability (Nicoletti, 2017; Durand, 2017).

c) Internet of Things (IoT)

The IoT is progressively becoming a popular topic during discussions about the digital era. It is a concept which has the prospective to affect how we live and work. The IoT refers to billions of physical devices worldwide that are now connecting to the internet, gathering and sharing data. Thanks to cheap processors and wireless networks, it is possible to turn anything, from a mobile phone to a drone, into a part of the IoT. This enables these devices to communicate without a human being involved, and merging the digital and physical worlds. It is estimated that by the end of 2022, there will be 8.9 billion mobile

subscriptions. IoT could give sellers, retailers and their banks access to real-time data on the services they monitor. Customers will have the opportunity to make smarter financial decisions in less than a few seconds through their mobile phones. Financial interactions, delivered through mobile devices, will be entirely contactless, whereas traditional financial services made of cards and papers are becoming obsolete. Insurance businesses are the one that could have the most of the benefits using the IoT. For example, with IoT, it could be possible for insurance businesses to record and possibly prevent damages. This idea might save costs in the end not only for reinsurers and investors, but also for people individually.

d) Robo-advisors

Robo-advisors are digital platforms that provide automated and algorithm-driven financial planning services like investing. A robo-advisor gathers information from clients about their financial condition as well as their future goals. To do this, a survey with a few online questions should be done. From the survey results, they then use the data to offer an advice. Fukoku Mutual Life Insurance, a Japanese insurance company, has replaced more than 30 of its staff by using IBM Watson cognitive computing software robot. The (biggest) advantage of robo-advisors is that they are low-cost alternatives to traditional advisors. By eliminating human labour, online platforms can offer the same services with a smaller cost. Most robo-advisors charge an annual flat fee of 0.2% to 0.5% of a client's total account balance, which is much less expensive comparing to a typical rate of 1% to 2%, charged by a human financial planner. Robo-advisors are always accessible for anyone having an internet connection. Efficiency is another huge advantage these online platforms have as with few clicks they can execute the trade instead of calling or physically meeting with a financial advisor.

e) Artificial Intelligence (AI)

The AI is a part of computer science which gives an emphasis to the creation of intelligent machines that react and work like people. The AI makes it possible for machines to learn from practice, to modify to new ideas and to perform human-like tasks. The AI can help banks in their anti-money laundering (AML) and counter-terrorism financing (CTF) screening (Arslanian, Fischer, 2019). A Swedish bank, SEB, which is using AI software from IPsoft for its customer service function had a great success in an internal project. Cognitive agents work as virtual assistants that can supposedly think and act like humans. SEB is the initial bank that has decided to use IPsoft's cognitive technology for customer services (Flinders, 2016). There is a diversity of opportunities that a financial institution can use AI technology to meet its goals like automation, customization, improved decision-making, and new value propositions. The deployment of AI technology contrary to the goal of automation allows a financial institution to raise the efficiency and speed with which a process can be completed by reducing or altogether eliminating human intervention in the process (Chohan, 2018). This, in turn, can reduce operational costs. Key application of AI in payments is the deployment of machine learning, which can enable more sophisticate algorithms to recognize suspicious behaviour, automate the process of classifying, triaging and resolving alerts. This decreases the number of false positive alerts, providing more customers with "straight-through" processing of their transactions (Vigna, 2017).

3.2. (Possible) solutions for current problems in the financial system

The banking industry is undergoing a radical shift, as the rise of financial technology and startups from non-banks are changing the competitive scene in the financial area. With the rising number of choices, many issues and problems appear in the current financial system. The transition period to innovative solutions, which started from legacy systems has not always been an easy task. Banks and credit unions need to embrace digital transformation if they hope to not only live but also prosper in the current landscape and stay competitive on the market. It is a great opportunity to fix (all) the errors and switch from the old to a modern one (McGoogan, 2017). In this part, we present solutions that include financial platform(s) of the future, digital currencies established by central banks and new types of payments:

a) Financial platform of the future

Successful platform would need to be ready to create innovative customer-centric experiences in a digital environment. It also must compile and work with a various set of bionetwork partners. It would must have the power to supply valued automated advice and product recommendations to customers. Lastly, it would must be capable to navigate the regulations surrounding the brokering of a variety of monetary products, but interestingly would not necessarily must navigate the regulations around holding deposits or manufacturing financial products, unless it specifically chooses to supply those products directly. The description may be a remarkably good match to today's large technology companies. Big technological companies do not need to "become a bank" to disrupt financial services - they only have to become a platform for the distribution of monetary services. Indeed, doing so would likely disrupt the national economy quite significantly if they were to create their own neo-bank that would attempt to duplicate the structure of current incumbents. Such an evolution would not be quite one like the trail that Chinese technology businesses like Alibaba have taken to dominate the Chinese market for consumer financial services (Sudhir, 2018). At the identical time, fintech neo-banks like Revolut, Monzo, and N26 will have the chance to use this regulation to improve their understandings about their customers (Sudhir, 2018). In reply, some financial institutions are considering beating technology firms to the possible punch, by building platforms by their own. As an illustration, in 2018, during Europe's largest fintech conference, the CEO of Dutch bank ING stated that the openness of digital platforms to third parties was especially significant to the bank of the longer term. He said: "If you really want to enable customers, you've got to provide them with the most relevant offering - even if a number of the services and products aren't your own". There are some advantages from the incumbent financial institutions; if they will move quickly, they will benefit of the very fact that they are already the reliable source of monetary services for many people, and will have greater advantages. In the meantime, incumbents seeking to become financial platforms will face an uphill clash to install new technology, while also wanting to fundamentally reorganize their operating model for a new way of doing business.

b) Digital currencies issued by central banks

An alternative to a payment token distributed by an oversized technology company that could avoid a number of challenges associated with the broad based adoption of such an asset would be a digital payment token delivered by a financial organization. In many ways, such a token would be just like a stable coin whose reference asset is the currency issued by that financial organization. However, unlike a stable coin, this token would be issued and fully backed by the financial organization (i.e., like a conventional fiat currency), so it will be easier for many users to own faith in its stability (Fruhlinger, 2017). According to Duhigg (2018), several central banks have tested the utilization of blockchain for this next generation real-time gross settlement (RTGS) systems. In these pilots, the financial organization creates effectively a digital token on a blockchain that is similar to the currency issued by the financial organization. However, in these pilots, the utilization of the payment token is exclusively limited to the chartered banks for clearing operations. These assets are often spoken as a "wholesale central bank digital currency". While interesting, the first purpose of those crypto-assets is to facilitate efficient financial organization clearing operations. Potentially far more transformative would be the issuance of such a token that will be available to be used by the typical citizen. A "retail central bank digital currency" would be effectively the equivalent of a bank note, but available in a digital form. Moreover, it may be transferable from person to person without an advert bank or payment service provider as an intermediary. There are many benefits for the issuing financial organization still. Real-time image of the facilitated economic action could be provided by this digital currency, possibly providing more accurate and timely economic data than available today. It may perhaps allow other new competences for the central bank, starting from more practical capital controls to improved tools to detect and prevent concealment (Fruhlinger, 2017).

c) New types of payments

The impact of technology on the way we pay is developing quickly. New payment form factors including QR codes, contactless credit cards and mobile wallets are integrating into our daily lives more and more. The growing ubiquity of those digital payments methods are making the utilization of cash less and fewer frequent in both developed and emerging economies. According to the Capgemini (2020), global non-cash transactions surged nearly 14% from 2018–2019 to reach 708.5 billion transactions, the highest growth rate recorded in the past decade. The growth was driven by increasing smartphone use, booming e-commerce, digital wallet adoption, and mobile/QR-code payments innovations. In advanced economies accepting digital payments has become easier and fewer expensive for merchants - maximizing the number of sellers who accept noncash payments. Indeed, in some European countries, digital payments became so ubiquitous that cash is becoming a rare commodity. In precisely ten years, the amount of money in circulation in Sweden has halved from 112 billion to 50 billion Swedish krona (US$6.14 billion). Without a doubt, academics at the Copenhagen School of Economics have gone up to now on suggest that by 2023, cash will be no longer accepted by Swedish stores, potentially making Sweden the world's first cash-free country (Duhigg, 2018).

3.3. Future prospects

New innovative and advanced digital technologies are reshaping the position of existing financial products and services. Fintech is becoming more and more disruptive by leveraging the most recent and advanced technologies like blockchain, big data analysis, cloud computing, IoT, robo-advisory, and AI. By (re)arranging these technologies, financial innovations can provide transparency, cost effectiveness and customer centric services. During this era of the IoT, the psychological behavior of shoppers and consumers of every industry has been changed. They demand quick service – wherever they are and whenever they need it. Their approach, thought-process and decisions about products and services have changed. Financial innovation is rising because technological development has enabled a profound understanding of consumer behavior and preferences. Getting to the center of how people buy and receive information to form their buying decisions is crucial for any business today. Cognitive analytics can also help financial service providers reach out to underbanked people and supply better access to finance for them when psychological biases are determined, understood, and overcome (Duhigg, 2018).

With only a few potential exceptions, financial institutions are not leading the event of latest AI techniques. Nor are many likely to start making such investments at scale in the near future. It means that competing financial institutions will essentially be performing from a toolkit of (different and complex) models that are in the end commoditized. Given this, how can financial institutions set up AI in a way that gives defensible and differentiated source of returns? The solution is that the information, which is employed to coach those commoditized models, can make an enormous difference in the relative effectiveness of their outputs.

Combination of AI and crypto might come together to reshape the financial ecosystem and our economy. One of the scenario is the combination of AI and crypto to deliver radical improvements to real-time auditing. Nowadays, accountants structure data into financial reports, including data such as balance sheet and income statement, but this style has some serious limitations. It is not practical for the auditor to review every transaction done by the organization or check every figure in the financial report. Auditors today miss some irregularities, which is counterproductive as the prime purpose of audit is to identify signs of potential material fraud.

In the future, we can imagine how AI and blockchain technology could be combined to extend the efficiency of the auditing process, while also improving its effectiveness at identifying and responding to fraud in real time. Blockchain technology will function as a trusted and immutable record, ready to provide one source of truth that is updated in near real-time. The AI will provide the analytic engine to process the info being added to it ledger in real time, applying its independent learning capabilities and pattern recognition to extract useful insights (Shields, 2017).

A corporate-wide IoT can be harnessed to automate the gathering and filing of this data, with both structured financial data and related unstructured data filed together within the system. With such a system in place, structured and unstructured data related to every transaction can be analyzed by an AI-based system for errors, irregularities, and potentially fraudulent behavior. This system can be built on a centralized, as an alternative to a decentralized, blockchain architecture. However, by adding blockchain into the mix,

immutability is often incorporated into this technique (Hertig, 2017). By involving one or more third-party validators, accountable for the verification of latest transactions and the maintenance of the immutability of the ledger, one could establish a provable assurance that each transaction (irrespective of how minor it is), has not been changed in any way since its initial entry (Duhigg, 2018). This would influence the role of auditors and huge audit firms additionally. As a substitute for young auditors with accounting backgrounds that the massive audit firms have today, they would need fewer but more qualified staff focused on smart contract coding or data science or on reviewing the frameworks rather than doing the manual reviews and calculation they often still do today.

4. Conclusion

Technological development is important for bringing new ways of functioning into international finance. Nowadays, when we are surrounded by mobiles, tablets, laptops and other gadgets, when the whole world is connected on the internet, when data and information are updating in a moment, financial services are trying to find new ways how to be competitive in this globalized world. Exchange of goods and services among the people was known from the earliest civilizations. People developed and started to use money as intermediary in the exchange process. Number of transactions was/is exponentially growing every day and yet, with the appearance of increasingly rapid digitalization, online markets and bigger quantity of people having ability to trade, it did not stop growing. These issues require new conditions, which has now evolved to include blockchain technology, cryptocurrencies, mobile computing, AI, IoT, virtual reality and other fields. What's more, as business-to-business e-commerce is growing, working on security, website functionality and service provider reliability is something needed if banks want to achieve success in the web based banking business. Banks provide many services, such as making new payments, use of debit and credit cards, direct debits, ATM, mobile banking, etc.

In today's world, speed and price competitiveness are truly important. With online banking, purchasers are not required to go to a bank office to complete the transaction; they can do it whenever they want – at home, at work, or on the go. Some banks even started to function completely online, with no physical branch(s). Reduced overhead costs related to not having physical branches give an advantage for online banks to supply consumers' significant savings on banking fees. Blockchain, as publicly available non-centralized ledger (being consensus-driven, immutable and having anonymity and interoperability) gives a number of features to potential users, such as more decentralized and transparent system where every participant maintains a copy of their transaction. Cryptocurrencies are another was of (secure) digital payments.

On the other hand, in order to improve the quality and accessibility of financial services, big data analytics could be used in the areas of customer behaviors, risk management and creation of strategies for banks and financial institutions. The IoT could, for instance, give banks and their clients access to real-time data, robo-advisor are there to give financial advice and support. Yet, problems such as lack of trust, high fees, unbanked individuals, risk of hacking attacks still prevail.

Possible solution could come in a form of new types of payments (including QR codes, mobile wallets, and contactless payments by mobile applications), financial platform(s) of the future (i.e. combo of AI, blockchain and crypto where each transaction will be updated in real time which gives fewer errors and more time to accountants to read reports and draw better financial conclusions) or digital currencies established by central banks (being decentralized but still providing stability and trust for most of the potential users).

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THE DANIELI INVENTORY OF MULTIGENERATIONAL LEGACIES OF TRAUMA: SURVIVORS' POSTTRAUMA ADAPTATIONAL STYLES IN THEIR CHILDREN'S EYES - THE CASE OF BOSNIA AND HERZEGOVINA

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Summary

Relying on Danieli's theory of multigenerational trauma this paper aims to validate the Inventory of Multigenerational Legacies of Trauma, born out of it, on the Bosniak sample. Collective trauma of the Aggression against Republic of Bosnia and Herzegovina was explored. It also investigates the post-traumatic adaptation of the parents through the eyes of their children. Participants were 114 adult children of Bosniak survivors, born between 1992 and 2002. Data was collected through the online questionnaire. Results of the exploratory factor analysis match Danieli's conceptualization quite well. However, there are several discrepancies when it comes to lower-order factors between the Bosniak sample and the original Jewish sample. The biggest differences are found within the Fighter and Numb style of parental post-traumatic adaptation. The results imply a possibility that the cultural/social/political/religious background of trauma defines the response to it and also its transmission between generations. Further studies on bigger samples are needed to explore how and why it happens.

Keywords: multigenerational trauma, trauma transmission, post-traumatic adaptation, collective trauma

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Danieli Inventar Nasljeđa Multigeneracijske Traume: Posttraumatski adaptacijski stilovi preživjelih kroz oči njihove djece - slučaj Bosne i Hercegovine

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Sažetak

Oslanjajući se na Danieli teoriju multigeneracijske traume, ovaj rad ima za cilj validirati Inventar Nasljeđa Multigeneracijske Traume, koji je iz nje proizašao, na bošnjačkom uzorku. Ispitivana je kolektivna trauma Agresije na Republiku Bosnu i Hercegovinu. Ova studija također istražuje percepciju koju potomstvo ima o posttraumatskoj prilagodbi roditelja. Uzorak se sastoji od 114 odrasle djece preživjelih Bošnjaka rođene između 1992. i 2002. Podaci su prikupljeni putem online upitnika. Rezultati eksploratorne faktorske analize se velikim dijelom podudaraju s Danieli konceptualizacijom. Međutim, postoji nekoliko odstupanja kada je riječ o faktorima nižeg reda između bošnjačkog uzorka i izvornog židovskog uzorka. Najveće razlike nalaze se u Borac i Otupljen stilu roditeljske posttraumatske prilagodbe. Rezultati impliciraju mogućnost da kulturna / socijalna / politička / vjerska pozadina traume definira odgovor na nju, a također i njezin prijenos između generacija. Potrebne su daljnje studije na većim uzorcima kako bi se istražilo kako i zašto se to događa.

Ključne riječi: multigeneracijska trauma, prijenos traume, posttraumatska adaptacija, kolektivna trauma

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Introduction

The Aggression against the Republic of Bosnia and Herzegovina (B&H) started in April 1992 and formally ended in December 1995, even though a full peace was not restored for several more months. The war started as an aggression of the so-called rump Yugoslavia (made of Serbia and Montenegro) and the Serb nationalist paramilitaries in B&H and targeted Bosniaks (Bosnian Muslims), Bosnian Croats as well as moderate Serbs and all those who showed their loyalty to their homeland of B&H. In the course in the war, especially in 1992, the war became more complex by military forces of the Bosnian Croats (HVO), supported by neighboring Croatia, starting a conflict with the Army of Bosnia and Herzegovina (ARBiH) in the southern country (Herzegovina) and central part of the country. This situation resulted in a war within the war.

The culmination of the Serbian aggression came in July1995 with the capture of the United Nation Safe Area of Srebrenica, a Bosniak enclave in eastern Bosnia, when more than 8000 men and boys were taken and killed over a span of just a few days (Karčić, 2015). The International Criminal Tribunal for the Former Yugoslavia (ICTY) found that the massacres at Srebrenica constituted a crime of genocide, the first such crime in Europe since the Holocaust. Before the Srebrenica genocide, Bosniaks of Prijedor, Zvornik, Višegrad, and Foča and many other places across the country suffered a similar fate, even though those events have not been characterized as genocide by the ICTY. Many concentration camps established on the territories held by the so-called Bosnian Serb Army (VRS) and the Croatian Council of Defense (HVO) where Bosniaks were beaten, starved, tortured, raped, and murdered. Among the most infamous ones being Keraterm (VRS), Omarska (VRS), Sušica (VRS), Trnopolje (VRS), Manjača (VRS), Heliodrom (HVO) and Dretelj (HVO) (Čekić, 1997).

Kunarac et al. was the first case of in national or international jurisprudence in which persons were convicted of using rape as a weapon of war (Mertus, 2005). Authors and researchers estimate that between 20,000 and 50,000 largely Bosniak women were systematically raped over the course of the war (Sharratt, 2011; Skjelsbaek, 2006). The topic of wartime rape is still sensitive in the Bosnian society as huge stigma surrounds survivors and children born out of rape (many women were held in camps to the late stage of pregnancy to assure that abortion wasn't possible).

Another massive traumatic event was the siege of Sarajevo, the longest siege known to modern warfare (1425 days). Residents were exposed to daily mortar shell bombing, snipers from the surrounding hills, and lack of food, clean water, and medical supplies. The outcome of the aggression and war was the death toll of over 100.000 people, according to the survey of war losses conducted by the Research and Documentation Centre in Sarajevo (YEAR). Hoare (2008) writes that 33,070 Muslim/Bosniaks, 4,075 Serb, 2,163 Croat, and 376 other civilians were killed, most of them killed by the Serb forces. Tokača (2012) mentions the number of 1 500 000 Bosniaks who were displaced from their homes during the campaign of creating a purely 'Serbian state' on the territory of Bosnia and Herzegovina.

Multigenerational trauma

It is a well-established fact in psychology that exposure to highly traumatic events can lead to post-traumatic stress disorder (e.g. Mueser et al., 2002; Fairbank, Ebert, & Costello, 2000) and other psychological disorders such as depression and anxiety on an individual level (Goenjian et al., 2000; Floen & Elklit, 2007). The idea that trauma could somehow be spread and transmitted dates back to the psychoanalytical approach and its followers (Freud, 1923; Horney, 1950). Scholars agree that trauma can be categorized as individual or collective. In the case of individual trauma, traumatic event(s) is experienced by a single person (such are childhood abuse or sexual assault). Collective trauma is a response of a large group of people or even societies to a highly traumatic event (war, genocide, colonization, or natural disaster) (SAMHSA, 2014). It is theorized that both can be passed onto a survivor's offspring. The first empirical studies of transgenerational transmission of trauma were conducted on the survivors of the Holocaust and their children. Danieli (1985) considers Rakoff's paper from 1966 to be the first among the literature dealing with this topic. In the mentioned paper she writes: «The parents are not broken conspicuously, yet their children, all of whom were born after the Holocaust, display severe psychiatric symptomatology. It would almost be easier to believe that they, rather than their parents, had suffered the corrupting, searing hell". After her study came many other studies with different authors using different terms to explain essentially the same phenomenon (multigenerational, intergenerational, and transgenerational trauma) (e.g. Sigal et al. 1973; DeGraaf, 1975; Danieli, 1981; Sigal & Weinfeld, 1989; Solkoff, 1992; Sorscher & Cohen, 1997; Yehuda et al., 1998; Shrira, Palgi, Ben-Ezra, & Shmotkin, 2011; Giladi & Bell, 2013).

Clinical studies have shown a wide variety of symptoms that can be passed down across generations: mistrust and distrust of the world, dysfunctional parental skills, chronic sadness, inability to communicate feelings healthily, constant fear that something bad is going to happen, pressure to achieve, separation anxiety, overprotectiveness and no ability to set clear boundaries (Barocas and Barocas, 1979; Freyberg 1980; Fogelman and Saravan 1980; Danieli, 1981). However, rigorously controlled empirical studies failed to confirm these results, i.e. children of Holocaust survivors (most studies were conducted on them) did not have significantly higher rates of psychopathology compared to control groups (Kellermann, 2001b).

Attachment theory's transgenerational transmission of trauma paradigm can be broken down into three constituting elements: parental trauma, child-rearing practices that came out of the traumatization, and elements of parental response to the traumatic event within their offspring. That means that trauma experienced by the parents significantly incapacitates their parenting skills which result in the child behaving and experiencing similar to parents symptomatology (Sigal, 1973). For example, Lurie-Beck (2007) explained that when unresolved pain, depression or generalized anxiety, and parental hypervigilance interfere with their ability to establish healthy bonds with their children and meet their emotional needs, traumatic symptoms can be passed on from one generation to another generation.

According to Volkan's (1996) psychodynamic approach transgenerational transmission of trauma happens when the consequences of trauma are passed from the trauma survivors to the next generation through conscious and/or unconscious processes. The

goal is to work through a traumatic experience and remove its negative effects. Trauma is handed down to the offspring and it becomes their task to grieve the losses of their parents and resolve negative emotions such as helplessness. He continues to explain how adults mold their children's ego mechanisms through open or hidden approval. As a result, a child may develop a vast array of symptoms to deal with the handed-down trauma. Volkan tried to explain the events that took place in the Balkan area in the '90s through the concept of 'chosen trauma' but failed, unable to recognize the complexity of the sociopolitical situation and the extent of Serbian propaganda.

Kellermann (2001a) gives a comprehensive review of the mechanisms behind trauma transmission between generations. He summarizes four theoretical approaches to these issues: psychodynamic, sociocultural, family system, and biological models. Psychodynamic approaches rely heavily on the works of Sigmund Freud and his followers. The emphasis is on unconscious processes and failure to differentiate one's self from their parents. Volkan's work represents this approach. The sociocultural view on this topic differs from psychoanalytical in a way that it emphasizes the conscious and direct influence of parents on children. Work relying on this point of view focuses on the child-rearing skills of a traumatized parent. Also, it explores how survivors model roles for their children. The biological models of trauma transmission across generations suggest that an individual could be more vulnerable to trauma due to genetic, epigenetic, or other biochemical factors. These models hypothesize that parental traumatization could be passed down much like any other hereditary condition. The approach based on the family system is a theoretical framework through which this study is conducted. It poses that everything that happens between a child and their parent, be it conscious or unconscious, happens in a certain family environment.

Theoretical framework

The present study relies on Danieli's (1981b, 1985, 1998, 2015) multidimensional and multidisciplinary approach in an attempt to assess trauma transmission between generations. The author argues that post-trauma adaptation of parents plays an important role in a way that it shapes the way that children see the world around them. Working with Holocaust survivors and their children she conceptualized three types of families that emerge in the aftermath of massive trauma.

The first adaptational style is Victim. It is characterized by feelings of profound worry, depression, inability to trust others, and general fear of the outside world. Other characteristics include overprotectiveness going in both directions (parents protecting children, children protecting parents) and the presence of guilt in parents and in children which links them both to the trauma.

The second style found in Danieli's framework is Fighter. Families who adopted this style highly valued building, creating, and achievement. At the same time, weakness and victimization were discouraged. Much like in Victim families, the distrust for the outside world and authority is present but without the elements of anxiety and general distress. Children of parents in which we can find this style of adaptation had problems with assigning responsibility and forming any kind of dependant relationships later in their life.

Daneli named the third style Numb. Silence is permeating every aspect of parents' trauma experience and emotions are deficient when it comes to this style. Love is expressed through financial aid, while verbal and physical contact is often neglected. These children often seek guidance and acceptance from the outside world, while their sense of worth is distorted.

Measures

For the needs of this study, the adapted version of the Danieli Inventory had 322 questions regarding parent's experience of the Aggression and children's response to it. The questions are separated into three parts: Part I - Parents' Posttrauma Adaptational Styles, Part II - Reparative Adaptational Impacts, and Part III - Four Generation Family History and Demographics. In the process of adaptation, context and characteristics of the Aggression unique to the experience of Bosniaks had to be considered. In the first two parts of the Inventory all items were opinion statements scored on a 5-point Likert scale (strongly disagree = 1, disagree =2, neither way =3, agree = 4, strongly agree = 5). The third part had open-end, multiple, and yes/no questions. Following the recommendations of the original author, cognitive interviews were conducted with 11 volunteers to assure that the translation process hasn't changed the meaning of the statements. In this procedure, after completing the questionnaire, interviewees were asked to comment on how they understood each statement from Part I and Part II and if they had any problems while answering it. Translation changes were made and the document was then back-translated to English.

Much like in the original study Part I had 120 items - 60 for mother and 60 for father, to ensure that the Inventory is suitable for single-family survivors as well. The instructions read,

The statements below describe ways of life in some families. You will be asked to state how much you agree or disagree with the statements as they apply to your family of origin. To indicate your level of agreement, please click the button next to your chosen response. First answer the question as it applies to your mother, then as it applies to your father.

The statements for the father followed immediately after the statements for the mother with response options directly below each question.

Procedure

A document was made in Google Forms and a link was distributed across social media (Facebook and Twitter) calling all eligible subjects to participate in the study. The link was made public and the share option was available. Participants were informed that their data will remain anonymous and will be used strictly for the needs of this study. Anonymous data was collected between February 2020 and July 2020.

Sample

Participants were 114 adult children of Bosniak survivors of the Aggression on Republic Bosnia and Herzegovina that took place between 1992 and 1995. The main criteria for inclusion were that at least one of their parents survived the Aggression and that they

were born between 1992-2002. The latter criteria were set as a means of control for the extent to which personal trauma had an impact on their current physical, psychological and social well-being. The majority of participants were women (63%). Participants averaged 25,15 years of age (SD=2,67). Most of them were born in Bosnia and Herzegovina (82,45%), while others were born elsewhere in Europe or the USA. Almost all of them were never married (86,84%) while the rest of them are living in their first marriage. In regards to their social-economic status, 58,92% of them comes from the middle-class families and majority of them holds either bachelor or master university degree (71,42%). All participants had at least one survivor parent, but we assessed and included the data of both parents, regardless of the individual parent's survivor status. The majority of mothers were in their twenties when the Aggression started (67%), as well as fathers (62%).

Results

7.1. Perception of Mothers' Behaviors

Means on mother items ranged from 1.6 (SD = 0.9), indicating the highest disagreement with the statement, "My mother did not believe in God after the Aggression/Genocide " (note that this item had to be reversed in the further analysis) to 4.4 (SD = 0.8), indicating highest agreement with "I was taught that people should never forget crimes committed against humanity (mother)."

As the sample is relatively small (N=114) for confirmatory factor analysis, we decided to conduct another exploratory factor analysis to investigate eventual discrepancies between the Jewish and Bosniak samples. According to previous work and theory (Danieli et. al, 2015), exploratory factor analysis was conducted assuming that the scale measures three types of parental posttrauma adaptation i.e. three factors. Principal component analysis was used as an extraction method with Varimax rotation. All items were reported on a 5-point Likert scale. Factor 1 was comprised of 28 items that explained 24.1% of the variance with factor loadings from .191 to .761. Factor 2 consisted of 15 items and explained 9.9% of the variance with the lowest factor loading being .264 and the highest being .825. The remaining 17 items constructed Factor three which explained 5.1% of the variance. Factor loadings ranged between .118 and .773.

Table 1. shows item loadings for each factor and whether they are congruent with the original study.

Table 1. Danieli Inventory of Multigenerational Legacies of Trauma, Part I: Posttrauma Adaptational Style, Final Scales for mother

Item	Item loading	Original study
Factor 1		
My mother reacted in a catastrophic way to even minor changes	.761	V
My mother behavior sometimes terrified me	.691	V
My mother seemed strange when compared to other mothers	.686	V
At times, my mother would suddenly look as if she was far away	.638	V

My mother might erupt in violent outbursts, then weep with regret	.638	V
My mother worried about everything	.615	V
My mother seemed frozen in time	.613	V
It was very difficult for my mother to provide reasonable limits	.592	V
Compared to other mothers, my mother seemed older than she actually was	.586	V
Listening to our traditional music made my mother sad	.585	V
Our home was full of sadness (mother)	.584	V
I never knew which of my questions/comments would upset my mother so I chose to not speak my mind	.578	N*
Family members were overly involved in each other's lives (mother)	.571	V
My mother used shame to control my behavior	.564	V
My mother used guilt to control my behavior	.559	V
My mother felt down on ethnic and/or religious holidays	.509	V
In our home, even the smallest decision had to be carefully considered (mother)	.501	V
My mother avoided watching/reading/listening to anything related her traumatic experience	.498	N*
My parents often seemed disappointed in each other (mother)	.498	V
My mother always ate very quickly as though the food would disappear	.480	V
My mother often woke up screaming from nightmares in the middle of the night	.467	V
My mother often screamed in order to feel heard	.455	V
My parents' marriage was primarily based on factors other than love (mother)	.430	V
Weakness was not tolerated in our home (mother)	.417	N*
Privacy was not allowed (mother)	.402	V
My mother wanted to know where I was at all times	.359	V
My mother did not believe in G-d after the Aggression and Genocide REVERSED	.260	F*
My mother wouldn't buy Serbian/Croatian goods REVERSED	.191	F*
Factor 2		
Our home was devoid of emotions (mother)	.825	N
Affection and open expression of love were rare in our home (mother)	.806	N
My mother often told me how important I was to her REVERSED	-.759	N
My mother often told me she loved me REVERSED	-.757	N
Closeness was rare (mother)	.748	N
Open communication seemed not to exist in our home (mother)	.719	N
While we were praised for achievements, there was little sense of intimacy in the family (mother)	.670	N
It felt dangerous to express emotions at home (mother)	.665	N
My mother did not give me any guidance	.570	N
In our family, feelings of distress were not to be admitted (mother)	.542	N
My mother was uncomfortable when interacting with others outside the family	.496	V*
Our social life included only immediate family (mother)	.396	V*

My mother viewed marrying outside the ethnic group as a betrayal	.390	F*
Humor was present even when things were difficult (mother) REVERSED	.-274	N
I was taught to mistrust authority (mother)	.264	V*
Factor 3		
I was taught to honor and remember the history of my/our people (mother)	.773	F
I was taught that people should never forget crimes committed against humanity (mother)	.703	F
In our family, the Aggression and Genocide were never mentioned (mother)	.-662	N*
The Aggression and Genocide was always present in the house (mother)	.639	V*
My mother taught me to be ready for anything that might happen in life	.592	F
Independence was highly valued in our household (mother) REVERSED	.525	V*
My mother repeated her Aggression and Genocide stories over and over again REVERSED	.509	N*
I was taught to fight against injustice (mother)	.472	F
Self-pity was considered a weakness (mother)	.435	N*
My parents did not feel that justice for their suffering was really done (mother)	.418	V*
I was expected to achieve career and financial success (mother)	.416	F
My mother never discussed her Aggression and Genocide experiences	.-404	N*
The continued safety of Bosnia and Herzegovina is a major concern in our family (mother)	.383	F
Family members were overly protective of one another (mother)	.373	V*
Other than with family members, we socialized almost entirely with other survivors from my parent's original community (mother)	.301	F
My parents' house was always stocked with food (mother)	.291	F
I was taught to stand up to authority (mother)	.118	F

* - items belong to the same scale in both original and current study

7.2. Perception of Fathers' Behaviors

Means on father items ranged from 1.7 (SD = 0.8), indicating the highest disagreement with the statement, "My father was uncomfortable when interacting with others outside the family" to 4.4 (SD = 0.8), indicating the highest agreement with "I was taught that people should never forget crimes committed against humanity (father)."

Almost all fathers were survivors themselves (92%), the remaining 8% were killed during the Aggression. The procedure of exploratory factor analysis was the same for fathers as it was for mothers. Factor 1 was comprised of 26 items that explained 21.9% of the variance with factor loadings from .147 to .764. Factor 2 and its 16 items explained 11.1% of the variance, factor loadings ranging from .204 to .772. Factor 3 explained the least of the variance (5.1%), the lowest loading among 18 items being .332 while the highest was .653.

Table 2. presents factor loadings for each of three factors for the father scale and its

comparison to the original scale.

Table 2. Danieli Inventory of Multigenerational Legacies of Trauma, Part I: Posttrauma Adaptational Style, Final Scales for father

Item	Item loading	Original study
Factor 1		
My father reacted in a catastrophic way to even minor changes	.764	V
My father's behavior sometimes terrified me	.709	V
My father might erupt in violent outbursts, then weep with regret	.685	V
I never knew which of my questions/comments would upset my father so I chose to not speak my mind	.681	N*
My father often screamed in order to feel heard	.634	V
My father seemed strange when compared to other fathers	.626	V
My parents often seemed disappointed in each other (father)	.615	V
My father often woke up screaming from nightmares in the middle of the night	.579	V
It was very difficult for my father to provide reasonable limits	.577	V
My father seemed frozen in time	.569	V
My father worried about everything	.562	V
My parents' marriage was primarily based on factors other than love (father)	.558	V
Our home was full of sadness (father)	.545	V
It felt dangerous to express emotions at home (father)	.521	N*
At times, my father would suddenly look as if he were far away	.517	V
My father felt down on ethnic and/or religious holidays	.508	V
My father avoided watching/reading/listening to anything related his traumatic experience	.500	N*
My father used guilt to control my behavior	.481	V
Listening to our traditional music made my father sad	.463	V
My father always ate very quickly as though the food would disappear	.437	V
Compared to other fathers, my father seemed older than he actually was	.429	V
In our home, even the smallest decision had to be carefully considered (father)	.396	V
Weakness was not tolerated in our home (mother)	.363	N*
Humor was present even when things were difficult (father) REVERSED	.-359	N
Privacy was not allowed (father)	.279	V
I was taught to mistrust authority (father)	.147	V
Factor 2		
My father often told me how important I was to him REVERSED	-.772	N
My father often told me he loved me REVERSED	-.767	N
Closeness was rare (father)	.762	N
Affection and open expression of love were rare in our home (father)	.743	N

Our home was devoid of emotions (father)	.705	N
Open communication seemed not to exist in our home (father)	.691	N
My father did not give me any guidance	.660	N
While we were praised for achievements, there was little sense of intimacy in the family (father)	.598	N
In our family, feelings of distress were not to be admitted (father)	.583	N
I was taught to fight against injustice (father)	-.554	F*
My father viewed marrying outside the ethnic group as a betrayal	.551	F*
My father never discussed his Aggression and Genocide experiences	.478	N
My father was uncomfortable when interacting with others outside the family	.321	V*
My father did not believe in G-d after the Aggression and Genocide REVERSED	.270	F*
Our social life included only immediate family (father)	.265	V*
I was taught to stand up to authority (father)	-.204	F
Factor 3		
The Aggression and Genocide was always present in the house (father)	.653	V*
I was taught that people should never forget crimes committed against humanity (father)	.610	F
I was taught to honor and remember the history of my/our people (father)	.585	F
My father taught me to be ready for anything that might happen in life	.578	F
Family members were overly protective of one another (father)	.562	V*
Self-pity was considered a weakness (father)	.528	N*
My father wanted to know where I was at all times	.510	V*
I was expected to achieve career and financial success (father)	.509	F
My father used shame to control my behavior	.482	V*
Independence was highly valued in our household (father) REVERSED	.458	V*
My father wouldn't buy Serbian/Croatian goods REVERSED	.450	F*
My parents' house was always stocked with food (father)	.435	F
In our family, the Aggression and Genocide was never mentioned (father)	.-427	N*
My father repeated his Aggression and Genocide stories over and over again REVERSED	.394	N*
Other than with family members, we socialized almost entirely with other survivors from my parent's original community (father)	.393	F
The continued safety of Bosnia and Herzegovina is a major concern in our family (father)	.364	F
My parents did not feel that justice for their suffering was really done (father)	.362	V*
Family members were overly involved in each other's lives (mother/father)	.321	V*

* - items belong to the same scale in both original and current study

7.3. Tests of Internal Consistency and Correlations

To test internal consistency McDonald's omega was used instead of Chronbach alpha according to the existing literature regarding Likert type scales (Gadermann, Ghun & Zumbo, 2012; Zumbo, Gadermann & Zeisser, 2007). It can be said that all of the scales have good internal consistency (Table 3.). The scale measuring Victim style had the highest internal consistency (ω = .93 for mother; ω = .91 for father) while the Fighter scale for mother had the lowest omega value (ω = .80).

Table 4. Internal consistency expressed in McDonald's omega

Adaptational Style	McDonald's omega ω
Victim Mother	.93
Victim Father	.91
Numb Mother	.91
Numb Father	.88
Fighter Mother	.80
Fighter Father	.82

Mother and father scales for each style were highly correlated (Table 4). For both mothers and fathers, Victim Style correlated positively with Fighter Style (rs = .34, .31, p < .001, respectively) and Numb Style (rs = .62, .56, p < .001). Fighter Style and Numb Style showed no significant correlation for neither mother nor father.

Table 5. Correlations between scales expressed in Spearman's rho

	1	2	3	4	5	6
Victim mother	-					
Victim father	0.77***	-				
Numb mother	0.60***	0.49***	-			
Numb father	0.59***	0.56***	0.72***	-		
Fighter mother	0.26**	0.18	-0.01	-0.04	-	
Fighter father	0.32**	0.28**	0.17	-0.02	0.81***	-

*p < .05**, p < .01***

Discussion

In this study, we examined the measure of multidimensional impacts of the Aggression on survivors and their children based on the Bosnian Bosniak population. The theoretical framework used in this study is the one by Danieli which poses that the adaptational styles of survivor families can be categorized into three types: Victim, Fighter, and Numb. The results of this study match her conceptualization quite well. However, there are sev-

eral discrepancies when it comes to lower-order factors between the Bosniak sample and the original sample. For example, for both mother and father Victim style consisted of factors thought to construct the Numb style (Weakness was not tolerated in our home (mother/father); It felt dangerous to express emotions at home (mother/father); I never knew which of my questions/comments would upset my mother/father so I chose to not speak my mind). The Numb style consequently contained items measuring the Victim style in the original study for both mother and father (My mother/father was uncomfortable when interacting with others outside the family; Our social life included only immediate family (mother/father). Factor 3 - Fighter style showed the greatest mixing with both presumed Factor 1 (Victim) and Factor 2 (Numb) items. The biggest discrepancy was between the Numb and Fighter scale where the lower order factor Conspiracy of Silence was highly loaded on Fighter scale i.e. in Bosniak Fighter families parents talked about their traumatic experiences and the Aggression in both, mother and father, cases was present in the home. Also, items regarding justice, independence, and security loaded on this factor. Given the fact that the sample was relatively small in comparison to the number of items, we will discuss only the role of silence and talking in the Fighter style (all of which loaded >.40, assuming that the others could be the result of a sample shortcoming. In Bosnia, there is a pervasive narrative both on a communal and broader political level which encourages talking about one's experience in the Aggression, since genocide denial is rampant in the country as well as in the region. The drive to build is strongly associated with building a community based on truth and justice. Further studies are needed to confirm this hypothesis.

Same as in Danieli et. al (2016) Victim style correlated with both Fighter and Numb styles, indicating possible co-occurrence of these styles in the general population. Numb and Fighter styles did not significantly correlate neither in the mother nor father case, so we can assume that those styles can not be found within the same family.

Regarding the study's methodology, there are a few problems that should be addressed. The size of the sample is the first and perhaps the biggest one. Part I of the inventory consists of 120 questions while the number of participants in this study is 114. Hu and Bentler (1995) suggest that there should be at least 5 to 10 respondents per parameter/item, while others (Kline, 1998; Loehlin, 1998; Boomsma and Hoogland, 2001) argue that at least 200 participants are required for both exploratory and confirmatory factor analysis. Possibility of the computational errors is high when the number of variables is higher than the number of participants. A larger sample is needed for more clear results.

Since random choice sampling was not employed there is always a possibility that a convenient sample could be tainted with bias. Kirmayer, Gone & Moses (2014) discuss this problem in their paper. It is extremely difficult, almost impossible to establish a definitive causal relationship between generations when it comes to trauma. Studies in this field are always retrospective, with limited data and possible recall bias. Just because someone ascribes their problems to past events does not mean that the causal relationship exists. People could have thought about their problems through the prism of multigenerational trauma and produced their narratives and attributions to confirm the model since the informed consent clearly stated that multigenerational trauma is being explored through the Inventory.

Another methodological issue is the length of the inventory. Some of the participants did not finish the whole Inventory and those who did mention how long and exhausting it was for them. In the following studies the Inventory should either be cut in half or some kind of compensation should be given to those who finish it. Following the recommendation of the Inventory author questions regarding inclusion criteria were given before Part I so none of the participants were excluded.

Conclusion

This study in general confirmed the existing theoretical framework of massive trauma adaptation proposed by Danieli. The results indicate that Victim, Numb and Fighter style can be found in the used sample. However, given the fact that there were a few inconsistencies when it came to Fighter style and lower order factors composing it further studies are needed, especially those with bigger random samples. The Inventory itself needs to be less time consuming. Also, future research needs to pay close attention to both past and current cultural and socio-political events that might shape the response to massive trauma. Furthermore, it is recommended that other approaches to the multigenerational trauma are combined with this framework. It would be useful to combine qualitative research with quantitative to get the deeper understanding of this wide-spread phenomenon.

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ECONOMIC FREEDOM AND ELECTRICITY CONSUMPTION THE IMPACT OF INTERNET USAGE ON ECONOMIC PERFORMANCE

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Abstract

This study aims to investigate the relationship, if any, between economic freedom, human development, electricity consumption, internet usage and economic growth. The annual panel data are collected for eleven developing countries in the period of 1995-2017. In the light of methodology, this research employs the panel VAR methodology and the Granger causality test. Empirical findings outline two-way causal linkage between human development and economic growth; economic freedom and economic growth; internet usage and economic growth. However, results of this study display one-way causality spanning from electricity consumption to economic growth. Herein, the selected eleven countries should promote economic freedom by providing a legal structure and a law-enforcement system that protect the property rights of owners. In addition, governments should focus on improving the lives people lead rather than assuming that economic growth will lead, automatically, to greater wellbeing for all. Overall, this study argues that a better understanding of how everyday practices are shifting, in concert with the provision and design of online services, could provide a basis for the policies and initiatives needed to promote economic performance.

Keywords: Economic Growth, Economic Freedom, Electricity, Human Development, Internet usage.

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1. Introduction

One of the most popular research topics in recent past has been the relationship between economic outcome and institutions. North (1990) defines institutions as: "the rules of the game in a society or, more formally, are the humanly devised constraints that shape human interaction". He also emphasizes that institutions have a power to "structure incentives in human exchange, whether political, social, or economic". To mention a few, Acemoglu et al. (2005) and Sirowy and Inkeles (1990) highlight that economic institutions are of primary importance to economic outcome since they influence the economic incentives. Institutions are composed of rules and regulations that can be important catalysts to achieve sustainable development. Moreover, institutional malfunction can degrade the environment (Mehmood et al., 2021).

A smaller group of scholars (Doucouliagos and Ulubasoglu, 2006; Haan and Sturm, 2000 and Wu, 2011, to mention a few) has given empirical evidence on the relationship between economic freedom and economic output or human development. The recent research studies agree that economic freedom as a pillar of the institutional structure has an important role while explaining the human development of the country. However, researchers in general are far from the final consensus on the direct links between economic freedom and human development, and the channels through which they function.

In terms of economic freedom, one of the most challenging tasks is selecting appropriate proxy variable. One of the most commonly used measures is Index of Economic Freedom launched by The Heritage Foundation. For over twenty years the Index has delivered thoughtful analysis in a clear, friendly, and straight-forward format. This Index tends to measure the effects of the liberty and free markets worldwide for over two decades. The motivation for building this index arose from the heroic events that took place in Europe 25 years ago. People who used to live in poverty and fear have experienced modernization in terms of economy and rebirth of productivity thanks to economic freedom (Index of Economic Freedom, 2015).

North and Thomas (1973) indicate that economic freedom is not a novel concept in economic theory. Yet, this concept has been discussed ever since the time of Adam Smith addressing that the freedom to operate business, supply factors of production, trade and the protection of property rights are the basic concepts influencing the progress of an economy. Furthermore, David Ricardo has emphasized the great role of free trade in stimulating economic growth. Additionally, Gwartney and Lawson (1997) suggest that economic freedom has been more productive compared to any other methods that can potentially control the economic activity. As of economic freedom, it is of great importance to distinguish it from political freedom.

Moreover, the difference between civil liberties and economic freedom should be clearly emphasized. Economic freedom aims to protect the property of individuals, their freedom to make a choice and to exchange on voluntary basis. The important is the role of government that will provide the protection of economic freedom. In the light of political freedom, it covers the inclusion in the political processes. At last, civil liberty gives the right to establish organization and guarantees the freedom of the press.

In terms of human development, UNDP advocates that Human Development Index (HDI) summarizes the achievement in key dimensions of human development: a long and

healthy life, being knowledgeable and have a decent standard of living. The health dimension is connected with life expectancy at birth; the education dimension is measured by mean of years of schooling. The standard of living dimension is measured by gross national income per capita. In terms of the time span covered in this research, it is important to emphasize that in the last decades human development was progressing impressively. If we compare the last observed year (2017) with the 1995 for example, it will be easy to make a conclusion that people are living longer and healthier now, more children are in school and more people have access to basic social services (Human Development Report, 2016). Supplemented with the internet, information and communications technologies (ICT) have transformed production processes in most industries in many countries. Hence, there are obvious important effects of ICT on the economy and on society in general (Maurseth, 2018). Recently, many studies were conducted to examine the relationship between energy/electricity consumption and economic performance. The overall findings show that there is a strong relationship between energy /electricity consumption and economic growth (see, for example, Ozer and Mensah, 2015; Amin and Murshed, 2017; Incekara and Ogulata, 2017; Satrovic, 2018; Ahmad et al., 2021; Mujtaba and Jena, 2021).

In the context of this paper, economic freedom, electricity consumption, human development and internet usage are expected to drive the economic performance of developing countries (Abul et al., 2019; Muslija et al., 2020; Bese et al., 2020; Huskic and Satrovic, 2020; Kirikkaleli and Adebayo, 2021; Khan and Hou, 2021). However, there is no consensus on the direction of this relationship. Herein, this paper analyzes a multivariate link of interest while observing the sample of developing countries. After the introduction, this paper summarizes the recent literature on the linkage of interest. Furthermore, data and methodology is presented. Results section summarizes the most important findings of this paper together with the interpretation. At the end we present concluding remarks and policy implications.

2. Literature review

The linkage amid economic freedom, human development, internet usage, electricity consumption and economic performance has not been explored quite intensively to date in the case of developing countries. The paragraphs to follow summarize the most important findings of recent empirical work on the matter. Economic freedom has received much attention among research community nowadays since it can play a great role in economic performance. Moreover, it can provide a clear reason why do some countries have better performance than others. Additionally, economic freedom can provide the answers to the question: why do some economies have higher growth rates than the rest of the world? Due to the fact that economic freedom receives much attention among research community nowadays, there are many studies exploring the linkage amid economic freedom and economic growth in developed economies. For instance, Scully (1992) and Barro (1996) provide the empirical evidence suggesting the positive linkage amid the variables of interest. These authors claim that economic freedom represents an important driving factor of economic growth i.e. the restriction of economic freedom is expected to slow down economic growth. The increase in economic freedom on the globe level was the consequence of the improvements in freedom from corruption, monetary freedom and

trade freedom (Beach and Kane, 2008). In terms of other economic freedoms (business, labor, financial and property rights) small declines are registered worldwide. In terms of the overall observed period, it is important to emphasize that the growth in economic freedom has slowed over the past years.

Merely exploring the linkage amid economic freedom and economic growth is not enough. A critical concern nowadays is whether the improvements in economic growth lead also to the socio-economic progress of the society. Although some countries have experienced growth rates, the percentage of population living in poverty was rising. Thus, it is of critical importance to observe the linkage amid human development and economic growth. As in the case of economic freedom, it is hard to measure human development. Human Development Report (2016) indicates that: "human development is all about human freedoms: freedom to realize the full potential of every human life, not just of a few, nor of most, but of all lives in every corner of the world—now and in the future". Georgiou (2015) explores the impact of economic freedom on human development index. Panel data are collected over the period ranging between 2000 and 2012. Data are collected for European Union countries, Japan and USA. The results of the paper give an empirical support that economic freedom improves human development approximated using human development index. Moreover, author has also reported that HDI is more general than Gini coefficient. He suggests that economic freedom drives entrepreneurship and improves education, health and income that are considered to be the main dimensions of human development. Using the data for developing countries, Satrovic et al. (2020) strongly support these findings.

The incidence of human development, the perceived level of corruption and the economic freedom on economic and social environment is explored by Begu et al. (2013). They have collected panel data over the period 2005-2010 for 41 countries. The obtained results imply that economic freedom could influence the human development level, but it doesn't mean that in all the countries with a high level of economic freedom people live better, it only brings some advantages in the possibilities of development. Economic freedom is also recognized as a key determinant of tourism industry in Muslija et al. (2019).

Nikolaev (2014) provides some preliminary evidence on the relationship between economic freedom and indicators of quality of life. The results indicate that the strongest effect of economic freedom is associated with some of the nonmaterial dimensions of quality of life such as community, safety, and life satisfaction. In addition, the findings of this paper suggest that changes in economic freedom foster human development in both the short run (five years) and the long run (ten years). Using the sample of 34 countries, human capital is recognized as an important driver of economic performance in Satrovic (2019b).

Claessen and Bellavitis (n.d.) have explored the potential economic freedom-human development nexus. For the purpose of empirical evidence, they have collected the data in the time span ranging between 1998 and 2007 for the sample of developing countries. As of proxy variables, they have utilized the Economic Freedom Index and Human Development Index. The findings of this research suggest positive relationship between the variables of interest. However, the major limitation of this finding is the fact that proposed models do not provide clear evidence on the link of interest due to the potential causality issue that is not addressed in the present research.

Madan (2002) aims to define the Economic Freedom Index and to investigate whether the improvement in economic freedom supports the economic performance. Addressing the fact that economic performance is a complex economic term, different determinants of economic performance are explored to see which of these determinants is most affected by the improvement in economic freedom. The empirical evidence presented in this paper suggests that improvements in trade freedom, protection of property rights and internal regulations have a significant positive impact on the economic performance.

Scully (2002) have explored the potential linkage amid economic freedom and economic growth. Moreover, the author has been interested to provide empirical evidence on the link between economic freedom and income distribution. The findings of this study suggest the increase in economic freedom to stimulate economic growth and to promote equity. Moreover, the model in reduced form served to investigate the effect of policy measures on growth performance and inequality of income. The findings of this paper suggest that more trade openness is positively correlated with economic growth as well as higher fiscal state. Anser et al. (2019), Abbasi et al. (2020) and Baye et al. (2020) have studied additional determinant of economic performance providing the strong evidence on the relationship between energy (electricity) consumption and economic growth. The relationship may very well run from electricity consumption to economic growth, and/or from economic growth to electricity consumption.

While most of the studies focus on the linkage between economic freedom and economic growth, Salahuddin and Gow (2016) suggest there are only a few studies analyzing the link between economic performance and internet usage. They use the case study of South Africa in the period of 1991-2013 to analyze the linkage amid internet usage, financial development, trade openness and economic performance. Empirical evidence highlights significantly positive impact of internet usage on economic performance. These findings strongly align with Maurseth (2018) who analyzes the relationship between internet usage and economic growth for the sample of 171 countries.

Medina-Moral and Montes-Gan (2018) have explored the role of institutions in the development process. The countries are grouped on "success" and enable the introduction of dynamics. The findings of this paper suggest that economic freedom is an important institution playing a crucial role in the growth process. Apart from the stage of development, entrepreneurial spirit is an engine of growth process in market economies. This is especially true in countries with the high level of economic freedom and favorable business environment that supports the entrepreneurial activity and consequently economic growth. Mehmood et al. (2021) support these findings suggesting that in India and Bangladesh, the modifying role of institutional quality is evident to reducing pollutant emissions but in Pakistan, this interacting effect increases environmental degradation.

Aforementioned paragraphs reveal positive link between economic freedom and economic growth; human development and economic growth; internet usage and economic growth; electricity consumption and economic growth. However, the studies do not agree on the causality direction. Therefore, this paper employs panel VAR and Granger causality test to evaluate the causal association between economic freedom, human development, internet usage, electricity consumption and economic growth for a sample of developing countries.

3. Data, variables and methodology

This paper employs the panel VAR methodology. It has been used quite often in the recent empirical studies. The main assumption of the VAR model is the presence of the set of endogenous variables. Panel data received much attention among research community nowadays increasing the usage of panel VAR model. This is since it can control differences among units of interest (Abrigo and Love, 2016).

Additionally, panel VAR models can control for the interdependencies that change in time. Besides these, Satrovic and Muslija (2019) indicate that panel VAR can be easy transformed into structural form so that impulse-response function can be estimated. The methodology applied in this paper is based on the propositions described in Abrigo and Love (2016). Equation 1 formalizes the panel VAR model as following:

$$Y_{it} = Y_{it-1}A_1 + Y_{it-2}A_2 + \cdots + Y_{it-p+1}A_{p-1} + Y_{it-p}A_p + X_{it}B + u_{it} + \varepsilon_{it}. \quad (1)$$

Covariates are denoted by and have the dimension of outcome variables have the dimension of and is denoted by . Fixed effects are having the dimension of and are assumed to be endogenous. represents the individual effects. The units of interest can take the values from 1 to N whereas period of interest can range between 1 and Innovations are assumed to: and under the condition that t >s. To provide the value of regression parameters, this paper relies on the fact that GMM estimation provides the solution to the potential bias caused by the first lag of . The justification is given by Abrigo and Love (2016). The multivariate model to be estimated in this paper can be presented in general form as (Eq. 2):

$$GDP_{it} = \sigma + \sum_{i=1}^{k} \beta_i\, GDP_{t-i} + \sum_{j=1}^{k} \theta_j\, HDI_{t-j} + \sum_{m=1}^{k} \varphi_m\, EFI_{t-m} + \sum_{n=1}^{k} \cap_n\, INT_{t-n} + \sum_{o=1}^{k} \emptyset_o\, ELC_{t-o} + u_{1t}$$

$$HDI_{it} = \alpha + \sum_{i=1}^{k} \beta_i\, GDP_{t-i} + \sum_{j=1}^{k} \theta_j\, HDI_{t-j} + \sum_{m=1}^{k} \varphi_m\, EFI_{t-m} + \sum_{n=1}^{k} \cap_n\, INT_{t-n} + \sum_{o=1}^{k} \emptyset_o\, ELC_{t-o} + u_{2t}$$

$$EFI_{it} = \tau + \sum_{i=1}^{k} \beta_i\, GDP_{t-i} + \sum_{j=1}^{k} \theta_j\, HDI_{t-j} + \sum_{m=1}^{k} \varphi_m\, EFI_{t-m} + \sum_{n=1}^{k} \cap_n\, INT_{t-n} + \sum_{o=1}^{k} \emptyset_o\, ELC_{t-o} + u_{3t}$$

$$INT_{it} = \omega + \sum_{i=1}^{k} \beta_i\, GDP_{t-i} + \sum_{j=1}^{k} \theta_j\, HDI_{t-j} + \sum_{m=1}^{k} \varphi_m\, EFI_{t-m} + \sum_{n=1}^{k} \cap_n\, INT_{t-n} + \sum_{o=1}^{k} \emptyset_o\, ELC_{t-o} + u_{4t}$$

$$ELC_{it} = \partial + \sum_{i=1}^{k} \beta_i\, GDP_{t-i} + \sum_{j=1}^{k} \theta_j\, HDI_{t-j} + \sum_{m=1}^{k} \varphi_m\, EFI_{t-m} + \sum_{n=1}^{k} \cap_n\, INT_{t-n} + \sum_{o=1}^{k} \emptyset_o\, ELC_{t-o} + u_{5t}. \quad (2)$$

Canova and Ciccarelli (2013) suggest that despite the fact that some authors criticize panel VAR models, these are still used intensively in the recent research. This is since panel VAR model controls for the individual heterogeneity and time interdependency. The methodology employed in this paper follows the propositions of Abrigo and Love (2016) and Love and Zicchino (2006).

To proceed to the empirical part, it is worth explaining the proxy variables of interest. GDP (GDP per capita (constant 2010 US$)) is proxy variable for economic performance. This variable is calculated by dividing gross domestic product by midyear population. Individuals using the Internet (% of population) – INT is the proxy for internet usage. These data are obtained from The World Bank. Electric power consumption (kWh per capita) – ELC is used to approximate electricity consumption. The data sources are The World Bank and International Energy Agency. HDI (Human Development Index) has been used as a proxy for human development. Data source is the United Nations Development Programme (UNDP). This index has been developed to emphasize not only the economic growth, but also the capabilities of people to evaluate the development performance of an economy. It includes three dimensions: health dimension, knowledge dimension and standard of living.

At last, EFI (Index of Economic Freedom) developed by The Heritage Foundation has been used as a proxy for economic freedom. Special attention is given to economic freedom in this paper due to the fact that it tends to have a positive impact on the majority of socio-economic objectives. Thus, it promotes human development, poverty reduction, environmental protection and healthier society. The use of these proxy variables has been justified in the studies to date (Ranis et al., 2000; Madan, 2002; Grzegorz and Krzysztof, 2011; Ozer and Mensah, 2015; Amin and Murshed, 2017; Incekara and Ogulata, 2017; Medina-Moral and Montes-Gan, 2018; Maurseth, 2018; Satrovic, 2019a; Huskic and Satrovic, 2020; Ahmad et al., 2021). To conclude the empirical findings, we used 500 Monte Carlo simulations to estimate the impulse-response function.

4. Results of the research and discussion

This paper starts by presenting measures of descriptive statistics in Table 1 for the eleven developing countries (Brazil, Russia, India, China, South Africa, Indonesia, Malaysia, Mexico, Philippines, Thailand and Turkey). The average value of GDP per capita (constant 2010 US$) is found to be 6160.06 for the eleven developing countries of interest. Brazil, Russia, South Africa, Malaysia, Mexico and Turkey record values that are above the group average. The maximum value of real GDP per capita is recorded in the case of Turkey in the last observed year, whereas India records the minimum value in 1995. As of Turkey, it has recorded a growth rate of 7.4% in 2017. This annual growth has been one of the fastest in the world. Exports have been supported by the depreciation in exchange rate. Moreover, domestic demand has been driven by fiscal stimulus based on the extension of credit scheme guaranteed by the government (OECD, 2018).

Table 1. Descriptive statistics

Stat	GDP	HDI	EFI	INT	ELC
mean	6160.06	68.10	58.91	21.62	2358.59
sd	3552.88	7.21	5.95	21.92	1704.37
max	14874.80	82.20	73.80	80.14	6810.17

min	674.62	46.30	45.10	0.00	263.62
skewness	0.103	-0.555	0.033	0.819	0.814
kurtosis	1.849	3.224	2.047	2.412	2.762

Source: Computed by the Author

In addition to the fiscal stimulation, the growth performance of Turkey has been driven by the well fragmented and diversified business sector. Investment sector is also strong but funded from the debt. Therefore the quality of investments is questionable as well as the allocation. Apart from this positive statistics, it is important to indicate the inflation above target that undermines the credibility of monetary policy. Starting from mid2016, macroeconomic policies have been directed to support growth performance. As a consequence, government expenditure increased significantly to grant the investment and employment incentives. In this regard, it is also important to emphasize the development of medium-size firms that tend to play an important role in the growth performance of less developed areas in Turkey. However, the further development of these firms requires better management and the development of technical skills but a foremost increased investment.

With regards to India, it has been a member of World Trade Organization (WTO) starting from 1995. It is important to indicate that the economic differentiation has been increased among the members of WTO organization starting from 1995. For instance, India has recorded 340% increase in GDP in the period between 1995 and 2017. In 1995, India records 10% lower GDP compared to Sub-Saharan Africa. However, the statistics form 2017 suggests that GDP in India is 50% larger than the GDP of the aforementioned African countries. Despite the fact that India records the lowest GDP among the observed developing countries in the year 1995, it has rose from 10^{th} to 5^{th} largest at the global level in the period between 1995 and 2017 (WTO, 2019). World Bank (2019) indicates that sustainable growth performance in India is strongly linked with the reforms of public sector, education, better infrastructure, increased exports and investments as well as the public health. Moreover, this overview suggests that sustainable development of India will significantly impact the world performance since India's case represents the ambition of the world to eliminate extreme poverty and to support well-being.

Human development index mean value is found to be 68.10. Brazil, Russia, Malaysia, Mexico, Thailand and Turkey have recorded average HDI above the sample average with the maximum value recorded in Russia in 2017 and the minimum value recorded in India in 1995. All three dimension of human development recorded a significant progress. As a result, Russia records maximum value of HDI in 2017 among the developing countries of interest. This rank suggests that human development is very high in Russia. In terms of India, UNDP (2019) displays 50% increase in Human Development Index in the period between 1990 and 2018. All of the dimensions of human development recorded a significant progress.

In terms of the Index of Economic Freedom, mean value is found to be 58.91. Sample countries that record above average are: South Africa, Mexico, Thailand, Philippines and Turkey. Maximum value is recorded in Malaysia in 2017 whereas the minimum value is

recorded in India in 1995. In terms of India, aforementioned paragraphs justify the minimum value. In Malaysia, it is worth noticing the fact that Prime Minister Mahathir Bin Mohamed has reduced the strong dependence of Malaysian economy on exports of raw materials; rather Malaysia economy started exporting service and manufacturing goods. Moreover, special attention has been made to the development of tourism and service sector. Maximum value of individuals using internet is reported for Malaysia in 2017 whereas China displays minimum value in 1995. Considering the electricity consumption, Indonesia reports minimum value in 1995 while Russia highlights the maximum value in 2017. Although our sample covers only developing countries, standard deviations suggest significant differences among these in all aspects of interest. After the description statistics, this empirical analysis moves toward exploration of the presence of unit root. For this purpose we have introduced the three most commonly used panel unit root tests namely: Levin–Lin–Chu (LLC) t* test, Im–Pesaran–Shin test, ADF – Fisher inverse chi square.

Table 2. Unit root tests

Trend included in the model		Method		
Variable	Test statistics	Levin-Lin-Chu (LLC) t* test	Im-Pesaran-Shin test	ADF – Fisher inverse chi square
LnGDP	Stat.	-0.91	0.71	33.33
	p-value	0.183	0.761	0.057*
D.lnGDP	Stat.	-6.80	-6.70	95.26
	p-value	0.000***	0.000***	0.000***
LnHDI	Stat.	-1.26	-0.14	22.83
	p-value	0.104	0.445	0.412
D.lnHDI	Stat.	-9.09	-8.20	86.97
	p-value	0.000***	0.000***	0.000***
LnEFI	Stat.	-0.39	0.65	16.41
	p-value	0.349	0.744	0.795
D.lnEFI	Stat.	-9.09	-9.10	95.76
	p-value	0.000***	0.000***	0.000***
LnINT	Stat.	-10.90	-7.39	153.30
	p-value	0.000***	0.000***	0.000***
D.lnINT	Stat.	-7.79	-6.78	45.17
	p-value	0.000***	0.000***	0.002***
LnELC	Stat.	-2.17	-1.57	31.27
	p-value	0.015**	0.059*	0.091*
D.lnELC	Stat.	-8.36	-8.39	102.92
	p-value	0.000***	0.000***	0.000***

Note: ***, **, * significant at 1%, 5% and 10% respectively.

Source: Computed by the Author

Panel unit root tests were performed for log level and first difference values. Table two summarizes the obtained results. The general conclusion from the Table 2 implies the non-stationary properties of log levels. However, all of the first differences were found

to be stationary. All of the variables are integrated of the same order I(1) suggesting that assumptions of panel VAR have been justified. Moreover, we have detected the number of lags need in Table 3.

Table 3. Decision criteria

Order	CD	J	J p-value	MBIC	MAIC	MQIC
1	0.689797	57.35438	0.935333	-334.979	-92.6456	-190.839
2	0.904874	45.35702	0.659919	-216.198	-54.643	-120.105
3	0.752017	18.70601	0.810995	-112.072	-31.294	-64.0252

Source: Computed by the Author

In the next step of this empirical study, we have employed GMM estimator to investigate the multivariate model of interest. Table 4 summarizes the obtained findings.

Table 4. VAR models

Independent variables	Dependent variables				
	D.lnGDP	D.lnHDI	D.lnEFI	D.lnINT	D.lnELC
$D.lnGDP_{t-1}$	0.036 (0.123)	-0.059 (0.014)***	0.404 (0.128)***	-3.506 (0.564)***	0.248 (0.109)***
$D.lnHDI_{t-1}$	7.344 (0.805)***	1.380 (0.116)***	-11.442 (1.117)***	21.044 (2.584)***	7.664 (0.837)***
$D.lnEFI_{-1}$	0.324 (0.117)***	-0.014 (0.015)	0.293 (0.945)***	-0.202 (0.377)	-0.236 (0.111)**
$D.lnINT_{t-1}$	0.103 (0.007)***	-0.002 (0.001)***	0.028 (0.009)***	0.479 (0.046)***	-0.021 (0.007)***
$D.lnELC_{t-1}$	0.851 (0.040)***	-0.067 (0.017)***	0.534 (0.192)***	1.017 (0.526)**	-0.532 (0.174)***

Note: ***, **, * significant at 1%, 5% and 10% respectively.

Source: Computed by the Author

Panel VAR model suggests a positive response of economic growth on human development, internet usage, electricity consumption and economic freedom. Table 5 summarizes the evidence from the Granger causality test. Empirical findings outline two-way causal linkage between human development and economic growth; economic freedom and economic growth; internet usage and economic growth. However, results of this study display one-way causality spanning from electricity consumption to economic growth. It is also important to notice that joint impact of human development, internet usage, electricity consumption and economic freedom on economic growth is significant as well as the other joint impacts.

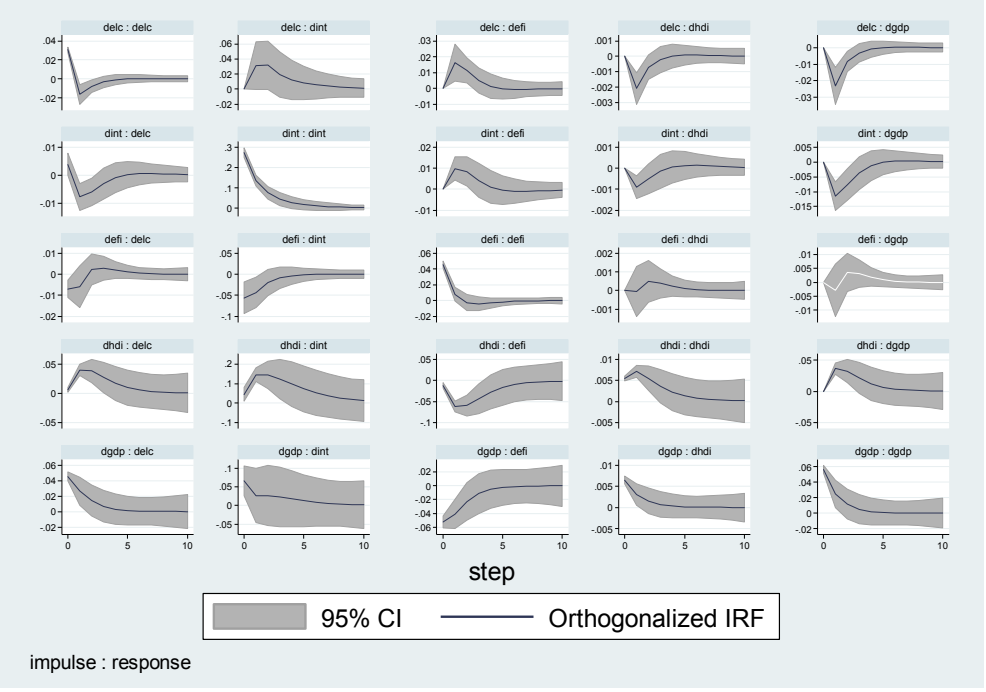
Table 5. Granger causality tests

Equation	Excluded				
	D.lnHDI	D.lnEFI	D.lnINT	D.lnELC	All
D.lnGDP	83.238 (0.000)*	4.640 (0.031)	19.933 (0.000)	15.399 (0.000)	92.988 (0.000)
	D.lnGDP	D.lnEFI	D.lnINT	D.lnELC	All
D.lnHDI	18.300 (0.000)	0.914 (0.339)	7.288 (0.007)	15.425 (0.000)	59.116 (0.000)
	D.lnGDP	D.lnHDI	D.lnINT	D.lnELC	All
D.lnEFI	10.032 (0.002)	104.794 (0.000)	9.370 (0.002)	7.751 (0.005)	110.875 (0.000)
	D.lnGDP	D.lnHDI	D.lnEFI	D.lnELC	All
D.lnINT	38.660 (0.000)	66.342 (0.000)	0.288 (0.592)	3.748 (0.053)	79.504 (0.000)
	D.lnGDP	D.lnHDI	D.lnEFI	D.lnINT	All
D.lnELC	1.977 (0.160)	83.758 (0.000)	4.497 (0.034)	7.584 (0.006)	86.423 (0.000)

Note: * p-value

Source: Computed by the Author

Graph 1. IRF plots



Source: Computed by the Author

At last, we have observed the linkage of interest by calculating the impulse-response functions. Human development index is found to react positively to economic freedom and internet usage, both in short- and the long-run, however short-run impact is found to be stronger. GDP is also found to react positively to economic freedom, human development,

electricity consumption and internet usage in the long-run. Therefore, special attention should be paid to support human development, internet usage, and economic freedom in developing countries in order to foster the growth performance and consequently to achieve the sustainable economic growth.

4. Conclusion

Not many studies analyzed the relationship between economic freedom, electricity consumption, internet usage, economic growth and human development in the case of developing countries. Hence, this paper aims to fill in this gap in literature by collecting balanced panel data for eleven developing countries over the period ranging from 1995 to 2017.

Panel VAR model suggests that economic growth responds positively to the human development index, internet usage, electricity consumption and economic freedom. Granger causality tests outline two-way causal linkage between human development and economic growth; economic freedom and economic growth; internet usage and economic growth. However, results of this study display one-way causality spanning from electricity consumption to economic growth. Herein, economic freedom, internet usage, electricity consumption and human development stimulate economic growth due to the fact that proper government incentives would drive growth process since most of the key dimensions of sustainable development are determined rather by economic freedom, components of human development, internet usage or electricity consumption.

The obtained results indicate that economic freedom, internet usage, electricity consumption and human development have been rising impressively in recent past. Yet human development has been uneven. Some individuals have achieved only the basics of human development while some not even that. Therefore, the improvement in economic freedom, internet usage, electricity consumption and human development tend to contribute economic growth in both, short- and the long-run. Hence, this paper suggests that in order to increase the human development, policy makers need to create incentives for economic freedom in terms of property rights, government integrity, judicial effectiveness, tax burden, government spending, fiscal health, business, labor, monetary, trade, investment and financial freedom. Governments play a great role in this process by recognizing the benefits of improvements in economic freedom. Socio-economic development is strongly driven by the trade freedom as well as the protection of human rights. Special attention should also be paid to the fiscal freedom. Countries that support economic freedom may not see instance improvements in income equality. These improvements are expected at a certain level of economic freedom. One of the limitations of this paper is the potential omitted bias. Hence, there is a great potential for future research. It will be of great importance to analyze the role of renewable energy in the inspected nexus.

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BEHAVIORAL ECONOMICS IN THE DIGITAL AGE

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Abstract

Behavioral economics is the link between psychological research and economics. The rise of behavioral economics is significant because people have ceased to be viewed as rational Homo Economicus. Behavioral economics gives people a role that is closer to reality, which shows that we are often irrational in our decision-making. We base our daily decisions on mental abbreviations or heuristics. In marketing, this has long been a well-known fact used to attract new customers. On the other hand, the concept of Nudge Theory means creating an environment that will use our irrationalities to make decisions that are in our best interests. In this paper, we have shown which are the most common heuristics by which people make everyday decisions. We have given examples of how these irrationalities are being used in today's digital age for marketing and other business purposes, but also how preferred digital technologies can be used to create a positive choice architecture. In today's digital age, when the amount of information and the speed of access to information is higher than ever before, it is increasingly difficult for people to make rational decisions. Therefore, understanding behavioral economics is very important in order to get to know and understand ourselves better and make better decisions. On the other hand, the choice architecture also raises several ethical issues, especially in the context of Digital Nudging, which need to be discussed so that the benefits of the idea of Choice Architecture in the digital age are not lost because of its abuse.

Keywords: Behavioral Economics, Choice Architecture, Digital Nudging, Digital Marketing, Ethics.

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1. Introduction

Although the father of modern economics, Adam Smith, wrote the book *The Theory of Moral Sentiments* twenty years before his most famous book, *The Wealth of Nations*, the theory of observing man as a perfectly rational being, *Homo Economicus*, prevailed in economic theory. In the last two decades, we have witnessed the academic rise of behavioral economics. Behavioral economics deals with the research of emotional, cognitive, and social influences on individual decision-making. Researchers around the world publish papers that point to the *illogicalities* in the behavior of individuals when it comes to making not only economic decisions, but also when it comes to personal decisions, such as decisions about employment, marriage, etc. Research from behavioral economics shows that we are often not rational in our behavior and that we make irrational decisions. Thus, instead of rational *Homo Economicus* people show themselves as irrational *Homo Sapiens*. Today, in economics, through the rise of behavioral economics, this fact is increasingly recognized. Thaler (2000) argues that economics in the future will be increasingly associated with human behavior, that economists will pay more attention to human emotions and human consciousness, and that they will make a clearer distinction between normative and descriptive theories. Simply put, *classical economics* considers people to be rational in their decisions, while behavioral economics indicates a certain irrationality in decision-making.

Among other things, the aim of the paper is to provide a better understanding of the way we make decisions and an understanding of the bias that often guides us in the process. This is especially important in the context of digital age and the amount of information that is available to us, which makes it even more difficult for us to make the right decisions that are useful to us.

Starting from the fact that people are irrational in their decision-making, bearing in mind that this irrationality is often predictable (Ariely, 2008), Thaler and Sunstein (2008) developed the concept of choice architecture, which means that people are possible, through creating an appropriate environment in which they make decisions, to be encouraged to make decisions that are beneficial to them in a way that maximizes their well-being. By applying digital technology, Internet of things, Big Data Analysis and AI, it is possible to use the results of research in behavioral economics to provide significant benefits to individuals and companies by helping them make better financial decisions, develop trust and better customer experience, better manage humane resources, and assess risks, etc.

On the other hand, critics of choice architecture ask the question whether creating an environment that influences people's decision-making is ethical at all? Who has the right to decide on behalf of someone else what is good for that individual, or what if choice architecture is used in the interest of the government or some interest groups and not individuals? The digital age with the amount of information available and the potential of digital technologies in terms of their use in creating the choice architecture requires a clear answer to these ethical questions.

2. Decision-Making and Bias

Making completely rational decisions also requires having all the information needed to make decisions. However, it is exceedingly difficult to provide all the necessary information because, on the other hand, it requires time and other resources, so the opportunity cost of making rational economic decisions is high, and therefore it is often not profitable.

Table 1. Some examples of heuristics

Type of heuristics	Explanation
Loss aversion	Kahneman and Tversky developed the Prospect theory where they showed that people do not experience equally equal gains and losses. They show aversion to losses (Kahneman and Tversky, 1979).
Scarcity	It is the kind of bias by which the subjective value of a good increases due to the very fact that it is scarce (Mittone and Savadori, 2009).
Anchoring effect	It is a cognitive bias when people use available information as an anchor, a starting point, when making a decision or assessment, whether or not that information is related to that task (Tversky and Kahneman, 1974).
Endowment effect	It is a bias by which people value things they own more than those they do not (Kahneman et al., 1991).
Framing effect	This effect shows that individuals' decisions are influenced by the way problems are presented. There is an unwarranted impact of problem formulation. (Tversky and Kahneman, 1981).
Decoy Effect	The decoy effect describes how, when we choose between two things, adding a third, less attractive option called bait, affects our perception of two basic choices (Ariely, 2008).
Status Quo Bias	Individuals tend to remain in the status quo, i.e., in the current state, because the disadvantages of giving up this state outweigh the advantages (Kahneman et al., 1991).
The Power of FREE	People are far more inclined to free compared to almost free. Offering something that is free significantly influences their choice compared to previous preferences (Ariely, 2008).
Herd bias	It is a psychological phenomenon where people observe other people's decisions when making decisions. They do what others do, instead of using their own information. This phenomenon is common in the capital market and is associated with the creation of market bubbles (Banerjee, 1992).

Source: Authors work

So, how do we make decisions? Individuals in the decision-making process use heuristics, which we can define as mental abbreviations, which allow us to make our decisions acceptable, but at the same time they are not always rational. Moreover, through experiments it has been confirmed that human behavior in the process of economic decision-making is often irrational and, more interestingly, predictably irrational. Heuristics are not a bad mechanism when making simple decisions, which do not have great potential harmful consequences, because the relationship between benefits and resource consump-

tion is satisfactory. However, when it comes to complex decisions that require more information, irrationality can have significant negative consequences. At the heart of this way of decision-making are two systems of the human mind. System 1 operates automatically and quickly, intended for routine operations, while System 2 focuses on mental activities that require effort and attention. As most of our decisions are routine, they are made by System 1, because System 2 is inefficient and *slow*. Therefore, we often show biases in everyday behavior and decisions that are characteristic of the operation of intuitive System 1 (Kahneman, 2011).

3. Digital Nudging

In the decision-making process, people rely on available information. In addition to information, the decision-making process is also influenced by the way this information is presented, i.e., the design of the choice environment. Thaler and Sunstein (2008) define nudging as any element of the choice structure that influences a change in people's behavior in a way that is predictable, without prohibiting any other choice option or significantly changing their economic incentives.

Choice architecture can significantly improve people's quality of life by creating a user-friendly environment. Any factor that significantly changes people's behavior can be considered an incentive. By using incentives, it is possible not only to improve the lives of individuals, but to help solve significant social problems. Incentives, for example, of governments, aimed at solving social problems do not represent measures imposed by someone, freedom of choice has not been abolished, and this represents a special type of paternalism, so-called Libertarian paternalism (Thaler and Sunstein, 2008).

Arguments leading to the acceptance of nudging point to the following advantages of this concept (Schmidt and Engelen, 2020):

- Nudging is cost effective, relatively inexpensive, and relatively easy to implement.
- It usually respects freedom of choice, and it usually does not change or remove options.
- People are more inclined to accept nudging in relation to interventions and punishments.
- Even without nudging, decisions will always be influenced in one way or another, because often a neutral decision-making framework is not possible.

Decision-making nudging in digital environments is defined as *digital nudging*. Given that people today carry out a significant part of their activities on the Internet and receive most of the information on which they make their decisions via the Internet, it is possible to create incentives to moderate their behavior in the digital environment via use of user-interface design elements. Digital nudging should not be viewed only in the context of the digital environment, because this type of nudging is used for behavioral changes in the real world as well. It does not just affect the decisions we make on the Internet but also how we behave after we turn off the digital device. With the increasing number of people making decisions through digital devices, user interface designers are becoming the architects of choice who consciously or unconsciously influence the decisions of an increasing

number of people. The user interface is becoming the basic choice environment today (Schneider et al. 2018).

The ubiquitous digitization of private and professional life requires that digital nudging will inevitably spread to many areas of application, as people increasingly use digital devices for decision-making in different situations and areas, and the devices themselves will also change according to their form and function (Weinmann et al. 2016).

Table 2 shows some examples of the application of digital nudging and their effects.

Table 2. Example applications of digital nudging and their effects

Use case/IS field	Nudging example/behavior change intervention	Effect on organizational or societal level
Business process management	Structuring complex input screens	Organizational
E-business and e-commerce	Displaying limited room inventory during a hotel-booking process	Organizational
E-finance and insurance	Setting defaults for frequently selected insurance plan options	Societal
E-government	Setting defaults to opt in for organ donation	Societal
E-health	Step counter app that provides feedback on activity levels	Societal
E-learning	Reminder to learners to engage with course content	Organizational and/or societal
Green IS	Smart meters to encourage energy savings	Societal
Security and privacy	Displaying the strength of selected passwords	Organizational and/or societal
Social media	Giving incentives, such as badges, for sharing or other activities	Societal

Source: Weinmann et al. (2016)
Digital Nudging, Business & Information Systems Engineering. 58(6), p. 435

The question of the ethics of choice architecture arises, which is especially important in the digital age, when individuals create a huge amount of information online that can be used to create environments that will encourage people to make decisions that do not benefit them but benefit others. This is especially important given the possibilities and potential of using the Internet of Things and Big Data analysis. Especially the possibilities of Big Data analysis and AI are great and can be used to analyze and understand the patterns of behavior of people observed in real time to draw conclusions about users' personal characteristics, cognitive styles, or even emotional states (Hibeln et al. 2017).

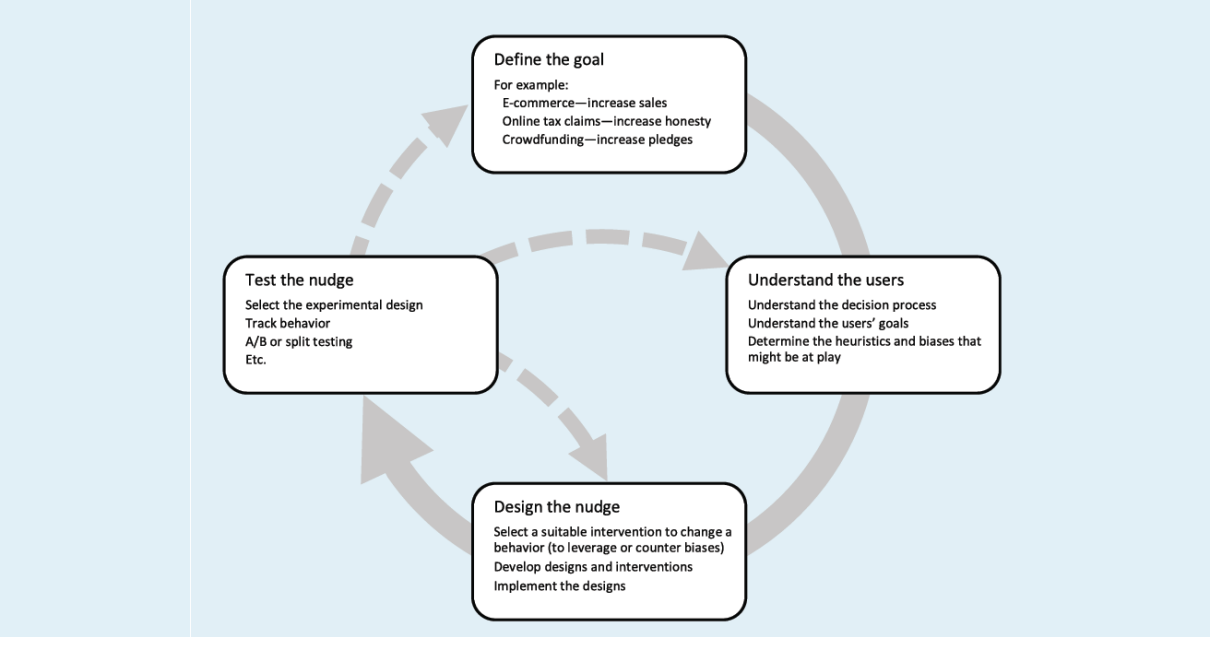
The social media provider uses information shared by social network users, the so-called consumers-workers who share their information through communication with friends and the public. The social media provider reaps the surplus value by exchanging information between consumers and consumer workers on social networks, which results from nudging social network users (Puaschunder, 2017; 2018). For example, comments and likes on posts that people post on social networks have no economic value for users, but they give them satisfaction in terms of meaningful work and motivate them to continue posting and sharing information on those social networks.

Also, messaging apps give users the information that the person they are communicating with has seen their message and is currently replying to it, allowing you to stay on the app for as long as possible while waiting for a response. It is obvious that in these cases there is a nudge that is not focused on behavior that benefits people, but exclusively on social media providers.

Starting from the guidelines for the application of nudging in an offline environment, designers can create digital nudges by taking advantage of all the benefits offered by information systems. Schneider et al. (2018) believe that designing Digital nudging should follow the following cycle shown in Figure 1. This can help architects choose to achieve their organizational goals through understanding users and potential nudging effects, so that desired effects can be maximized and/or unintended effects minimized.

The user-interface design of any digital device influences choices, even unintentionally. However, in user-interface design, usability and aesthetics are often primarily considered, ignoring potential behavioral effects. Expanding the field of computing through the acquisition of knowledge about digital nudging can help user-interface designers to create an environment of choice by taking advantage of digital nudging opportunities to common organizational goals (Schneider et al. 2018).

Figure 1. Designing digital nudges follows a cycle



Source: Schneider, C., Weinmann, M., Brocke, J.v.. (2018). Digital Nudging: Guiding Online User Choices through Interface Design. Communications of the ACM. 61(7), p. 69

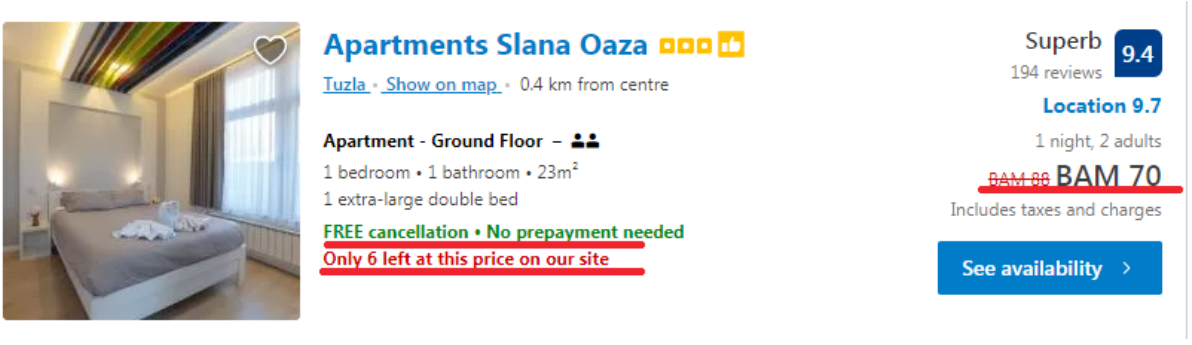
4. Examples of Digital Nudging Applications

Although *classical economics* has long shown an underestimating attitude toward behavioral economists' research, marketers have long seen the potential to increase sales of products and services, through exploiting bias and irrationality in human behavior. As with other marketing tools, there is a fine line between using behavioral economics to improve the consumer experience and using it to manipulate consumers.

Customer manipulation or *Phishing for Phools* as Schiller and Akerlof (2015) call it is especially important to understand in the digital age, when the availability of content through digital media and the amount of information is incomparably greater than before.

In Figure 2 we can see on the example of the platform for offering accommodation, booking.com, how through interventions on the user-interface can influence consumer decision-making. Underlined are the user-interface design elements that focus on individual bias. These elements target three predictable behaviors, or the three heuristics we use in decision-making (Scarcity, The Power of Free and The Anchoring Effect).

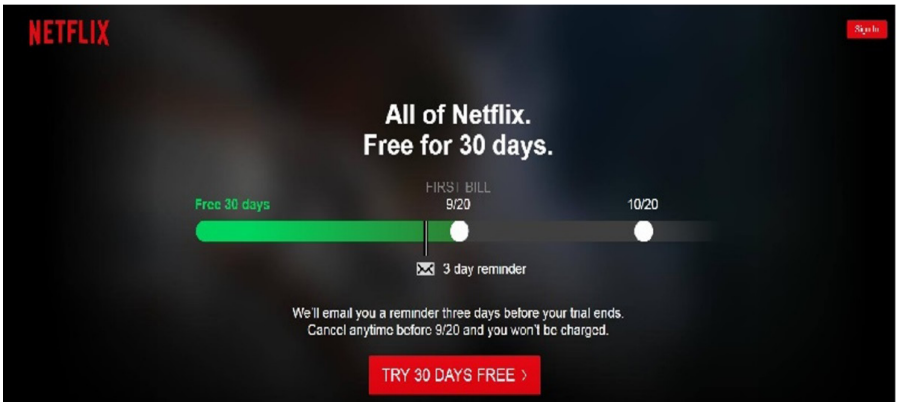
Figure 2. Application of digital nudging



Source: www.booking.com

Figure 3 shows how the online movie and series platform netflix.com uses in the design of user-interfaces that target individual bias. By offering a trial period of 30 days for free, *The Power of Free* heuristic is first activated, which leads to the acceptance of the application. After that, due to the action of the Endowment effect, people become reluctant to give it up

Figure 3. Application of digital nudging



Source: www.netflix.com

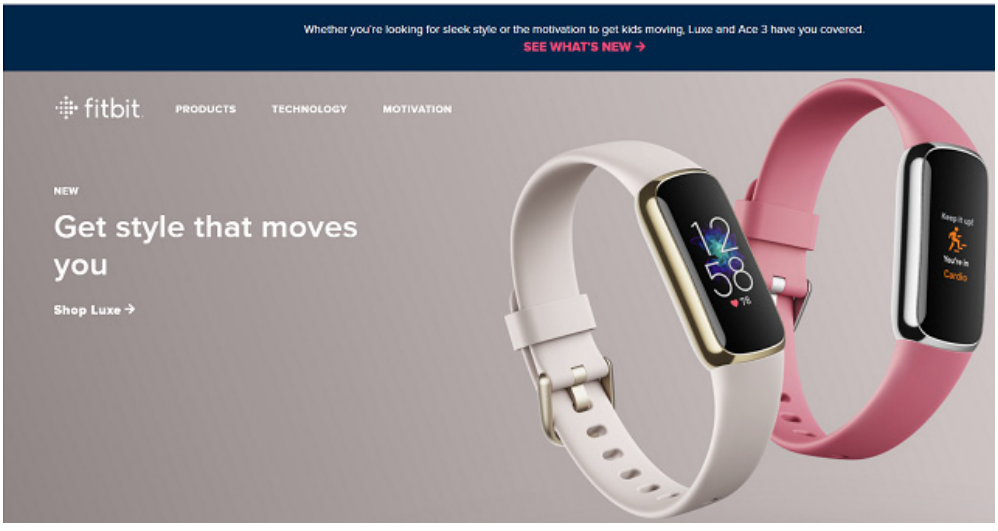
The strategy of Stitch Fix, an online styling service, is also based on the Endowment effect. The customer can try on clothes at home, keep what he likes and send back the rest. When a customer has received and tried items, he feels a sense of attachment and is likely to keep them.

We can see the Power of Free on the example of various applications such as You Tube and Viber if we compare their attractiveness. How attractive would these applications and social networks be if you paid even a minimum monthly amount of, e.g., $1?

It is said that in marketing, the line between improving the consumer experience and manipulation is very thin. In the case of sharing economy platforms or online sales platforms, the benefit to consumers cannot be disputed using these platforms. The user-interface of these platforms helps the customer to avoid the Decision paralysis that occurs when we are faced with too many choices, and we are not able to evaluate them all well. To help customers choose the right service these platforms offer a wide range of filters thus helping their customers to sort products and services. The experiences of previous users as well as their evaluation of the provided services help them in that, and today Big Data analysis and AI are increasingly used to make the choice even easier based on the previous behavior. It is also used by search engines like Google to provide the easiest and fastest way for consumers to access those websites and services they use most often.

Also, in the case of the model that uses Netflix shown in Figure 3, they notify customers of the date when the free usage period expires, thus ensuring that people, because of their tendency to be forgetful, are not *caught* using their service if they do not want it.

Figure 4. Primjena digital nudging



Source: www.fitbit.com

Fitbit watches, which are part of Google, have an effect in terms of encouraging healthier lifestyles, reminding users to become active by collecting data on their activity and health parameters. In this way, they benefit not only the users but also the whole society.

Applications such as Digit, Monzo or Capital help users to better manage their finances, with services created based on research results coming from behavioral economics. The concept of digital nudging refers not only to the current decision-making of consumers

online, but also to various other contexts, from social media to organizational information systems. Although digital nudges influence the decisions of individuals at the time of decision-making (Miesler 2017), on the other hand presenting reviews, facilitating search and shopping, tagging has a strong effect on user behavior in general and it is important to observe this in general in terms of behavioral economics research in the digital age.

5. Ethical Questions Relating to Nudging

Bias and heuristics are present in both the online and offline worlds. From the very beginning, the concept of nudging had its followers, but also opponents. Critics are mostly concerned with the ethics of nudging. They believe that nudging is contrary to basic moral values, such as freedom, autonomy, respect, and dignity (Schmidt and Engelen, 2020).

In general, critics of the concept of nudging point out the following arguments (Renaud and Zimmermann, 2018):

- Nudges can jeopardize the autonomy of action and thus affect dignity.
- Nudge design often does not suit the intended purpose and can produce side effects.
- It is a questionable assumption that nudge developers know what is good for individuals or society given the complexity of social relationships and decision-making.
- There are concerns that not every intention that a nudger has is good, but that it is focused on making a profit for the one who creates the environment in which decisions are made.

The issue of ethics in the concept of nudging is especially important today in the digital age. The amount of information, the exposure to information through ubiquitous digital devices makes us exposed to different types of nudging. The development of Big Data and AI enables the application of nudging in a very sophisticated way, further influencing how people make decisions. Bias and heuristics are present in both the online and offline worlds.

The issue of ethics in the creation of the choice architecture is especially important in order to be able to take advantage of this way of helping people in making complex decisions. Otherwise, if governments or the private sector used the choice architecture to psychologically manipulate an interest that is not best for the people, this could lead to pressures that would lead to bans on this type of action. Responding to criticism, Thaler and Sunstein (2008) state that it is important to follow certain principles when creating choice architecture to keep its designers on the ethical path. Basically, the choice architecture should be created so that:

- Nudging must be useful, i.e., aimed at improving the well-being of those who are nudged.
- There must always be a choice.
- Be transparent, which means that those who seek to implement a particular policy through the choice architecture must be ready to make it public.
- In some issues, such as the appearance of ballots or encouraging private companies to have their employees buy their shares, the choice architecture must be neutral.

This is important because there is always a certain choice environment that also imperceptibly influences our people's decisions.

If companies or governments follow these principles, the possibility of a real win-win situation is created for both users and those who create the environment of choice. The principles are especially important in the digital age when exposure to nudging is significantly higher than in the offline world. User-interface design influences choices, even unintentionally (Schneider et al. 2018), so it is particularly important to consider whether such a design causes negative side effects and efforts should be made to prevent this.

6. Conclusion

With the development of behavioral economics in the last two decades, the paradigm of man as a rational decision maker has been largely abandoned. Mostly experimentally, behavioral economists have discovered more and more situations in which people behave in a way that is not predicted by classical economics. Moreover, it seems that these irrationalities are predictable, and that people often use heuristics, i.e., mental abbreviations, in the decision-making process. Our decisions are largely determined by the design of the environment in which we make decisions. Considering the predictability of human irrationality and the influence of environmental design, it is possible to influence people's behavior by creating the choice architecture, helping them to make the right decisions. Of course, this also raises many ethical questions, and transparency, usefulness and freedom of choice are necessary preconditions for the use of nudging.

In the digital age, the amount of information, the development of Big Data and AI create the conditions for a much more pronounced application of nudging compared to the offline world. Each user-interface also unintentionally represents a choice architecture that can also have negative side effects. In this paper, we have shown some examples of the application of nudging in the digital world, especially in the context of companies' efforts to attract their customers. This paper represents a modest contribution to understanding the way we make decisions and how we are exposed on a daily basis to different decision-making designs that influence our decisions.

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BLOCKCHAIN AS A BASE FOR CONTEMPORARY EDUCATION

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Abstract

Businesses in global environment are constantly adapted and new employees are expected to possess fresh "workers of tomorrow" skills and knowledge. Situation got even more rough when almost overnight COVID-19 influenced everyday lifestyle.

On the other side, it became clear that education systems are to be changed in near future. Some institutions already started to work of that process. Others are aware that need is here, but deciding about optimal approach. Dynamic times are expecting flexible models of teaching and learning so finding best solution is a must for all contemporary teaching institutions.

Blockchain as a new and disruptive technology has been perceived as a basis for cryptocurrency. However, its abilities and benefits could be utilized in different aspects of life, work and learning. New implementation of this technology could announce different point of view in education process, no matter if we are talking about studying as formal or learning on work as informal process.

This paper has a goal to explain blockchain fundamentals and research on how it could be implemented in learning process. Also, any possible usage of such technology in lifelong learning and certification process is another outcome which paper should summarize. Current market situation and expectations for wider blockchain usage will be discussed and researched in detail.

Keywords: information and communication technology, blockchain, education management, career development.

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1. Introduction

In todays' world it is clear that new paradigms are constantly introduced in everyday lives. Maybe the best example is COVID-19 pandemic which caused major transformation of every segment in just couple of months. Being able to adapt and adjust to new environment became not just a buzz word in media and social networks, but new normal which is obviously here to stay for some time.

Business sector is always changing (Shemesh Jesse, 2021). Numerous articles and web content is proving that more then ever companies are influenced with globalization, new technology and fresh customer-oriented approaches. On the other side, huge gap in label market needs and offer is causing in finding new trends of remote work (even before pandemic) in fields where that is possible. If we are considering business sectors as tourism or construction it is almost impossible o find a good worker no matter on salary or corresponding perks (Nenad Ivanović, 2021). Tech and high skilled industries as IT is has even worse situation. Even though some predictions about IT expert needs which EU provided, became overestimated (Peter Teffer, 2021) it is definite that skilled information and communication individuals are able to choose company and working environment. (S. Paparella, 2021).

It's old news that education system should be adapted as it must provide better "worker of tomorrow" pool. The rapid changes in new normal are just putting new demands on education system (Miriam Bar-Yam, 2002). Again, other side of this medal is resistance to change which is known in educational system. There are some common resistances in modernization, but also specific reasons for the rejection or obstructing the introduction of new solutions to education (Puvača & Zdrilić, 2012). World wide pandemic and health issues placed a lot of countries in so called "lock downs". E-learning came to spot light in minutes and every IT enhanced education which is available at least in last ten years, became a must in kindergartens, schools and faculties. A lot of challenges during pandemic online education were pointed out in recent studies (ex. lack of student engagement, interactions or attendance and distractions) but also a highlight of at least 40 different pedagogies which were successfully implements in virtual classrooms (Kundu, 2021).

Another current problem in domestic surrounding is public or private school system. Private school institutions are seen as "pay and pass" systems where student will surely finish it. However, it is obvious that such schools are able to work with smaller groups and provide more recent knowledge (Sara Šokić, 2019). Also, there has been an increase of faculties and study programs in last decade which provides additional issue in quality and employability recognition among freshmen. At the top of this facts, business sector simply cannot track nor understand different titles of graduates (ex. baccalaureate or graduate in various fields).

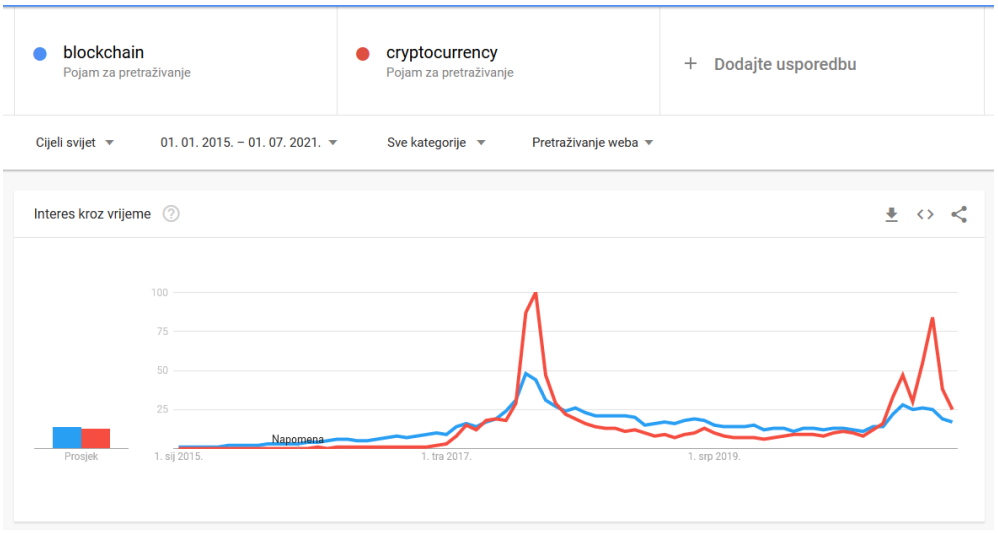
Quality recognition together with standardization is occurring in education (Ivković, 2009). However, that process is taking for some time and still not providing optimal results. Information and communication together with contemporary technologies definitely cannot solve all mentioned issues, but maybe can provide a good base for its wider and faster solving.

2. Blockchain

New technology called blockchain took first place in media coverages in last 6-7 years even though it was introduced by a person (or group of people) using an alias Satoshi Nakamoto in 2008. Some experiments with predecessors of this technology were noted in 1990's but insufficient computer power made it impossible for development. Its name is consisted from technology structure – a chain of blocks. Each block is linked to previous block with cryptographic hash and making it that way almost impossible to interfere with chain structure, order or values[2]. A block has own data structure which enables value storing and securing. Main idea was to handle financial data – transactions but via blockchain further development it is seen that numerous data types (use cases) can be stored:

- Images (Koptyra, 2020),
- Full user / company backup (Storj, 2015),
- Database BigchainDB (BigchainDB, 2016),
- Automatized (smart) contracts execution (Ethereum.org, 2021),
- …and a lot more.

Figure 1. Blockchain and Cryptocurrency trends in searching on Google



Source: Author work on Google trends[3]

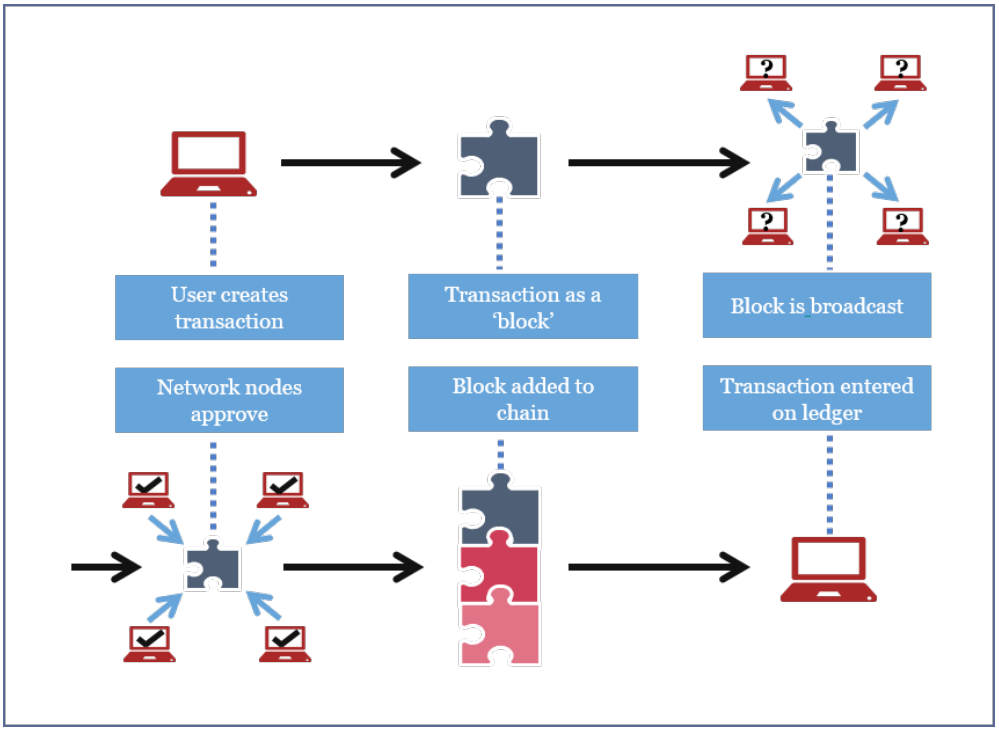
Mentioned hype about blockchain has started mainly because of cryptocurrencies. As it can be seen on Figure 1. main amplitudes were in search terms when crypto had highest values. Similar interest (up and down) was followed by blockchain term. Cryptocurrency

2 Of course, there are articles about blockchain vulnerability (Cipher LTD, 2020) however as technology is growing it is expected to be more secure and adapted.

3 The Google trends service analyses user searches on Google platform. In the case of a larger number, it easily defines trends or keywords that record an increase. The graphs show the relative interest on a scale of 0-100 in relation to the nominal number of searches on a particular topic, content or similar. More details on https://support.google.com/trends/answer/4365533.

is a form of digital asset based on a network that is distributed across a large number of computers (Frankefield, 2021). Global idea is to replace classical fiat currency and enable transactions without the need of "middle man" (banks, credit institutions etc.). However, cryptocurrency value is highly volatile making it risky investment and making it difficult to implement in wider usage. Since no central or trusted party has an ability to control it, values can rise or drop in just couple of seconds. Just because of its fluid prices, cryptocurrencies made a room for wide range of scams and frauds. Technology enhanced speculations and investments reminds on situation before dot-com bubble in 1990s. More likely (as it was back then), some of main players (among 11.183 current cryptocurrencies) will survive plus remain active and allow more active usage of blockchain technology (similar to Amazon and Google staying after dot-com bubble).

Figure2: Blockchain technology flow



Source: PwC Digital Services

Blockchain flow as shown in Figure 2. has ending base in main - distributed ledger where all "transactions" are stored and can be shared in an environment. Members of "ecosystem" has own copy of information which must be validated collectively upon any updates. This solution is allowing blockchain to be secure, reliable and trustworthy platform. Some main advantages could be pointed out:

- Verifiability / traceability – in case of distributed ledger each transaction is approved by verifiers (ex. miners in Bitcoin). Any member of the platform may verify the correctness of the system state. All actions are stored and easily traced.
- Privacy – no user can be discovered within blockchain network only its transactions / actions.

- Integrity – data is secured and protected from unauthorized modifications (close connection with verifiability).
- Transparency – depending on role in environment data is seen and is required for confirmation.
- Redundancy – provided by replications to verifiers.

3. Blockchain and education

From everything mentioned main question arises – how blockchain can be implemented or used in education? It is obvious that current situation with blockchain usage is not suitable and simple for end user. Average user identifies blockchain as Bitcoin or maybe altcoins[4] and its values. User experience still assumes considerable skills in terms of adjusting wallet or using cloud solutions as CEX (Bitcoin & Cryptocurrency Exchange | Best Bitcoin Trading Platform - CEX.IO, 2021).MetaMask (MetaMask, 2021) as browser / mobile application is maybe more user friendly however still not simple and understandable as Facebook login process. It seems that whatever company makes blockchain usage simple as today's web/mobile applications will get enormous popularity and users.

Earlier stated challenges in education as standardization, verification and trust could be solved within blockchain technology. Included stakeholders in education process:

- students,
- teachers,
- administration staff,
- business sector,
- NGO,
- government, accreditations, testers,

… would be able to participate in controlled chain of information. Verifiability of student skills and knowledge could be done in seconds as well as diploma check with corresponding university. Administration staff would be able to trace previous student grades (ex. high school) before enrollment and have a proof of each study year as hash value in education blockchain.

Of course, cons of this setup would be complicated user experience and customized applications tailored for stakeholders. Question of main authority (as Ministry or Central academic IT provider is) is also open issue. Since blockchain is available for certain time now, it is notable that some institutions are experimenting with this orientation. European union provides wide report (Grech & Camilleri, 2017) on more than 100 pages in 2017. about possibilities and current pioneers in this tech field. Different aspects of certificates, security, infrastructure and acceptance are considered as well as best practices back then described via interviews with responsible institutions.

Since blockchain is new technology and grows rapidly it is interesting to see that some

4 Term related to all cryptocurrencies other than Bitcoin.

institutions are providing rewards for new prototypes and solutions. One example is (Office of Educational Technology - Department of education USA, 2020) where it "explores novel applications of distributed ledger technologies like blockchain to address complex challenges in education. EBI focuses particular attention on understanding how blockchain technology can facilitate the secure, traceable, and verifiable exchange of educational data among institutions in the learning and employment ecosystem.". Almost one million dollars is given to applicants and it would be interesting to see solutions they will be coming up with (by the end of 2021).

Some papers are also oriented in research on practical cases of blockchain implementation. There's notable increase in articles and reviews of such approach (Raimundo & Rosário, 2021). However, in 2019. (A. Alammary, 2019) states "although the volume of literature on the application of blockchain to education has been increasing in the last few years, it is still fragmented, and no systematic review has yet been conducted on the topic."

As per all researched literature, Table 1. is providing summarized overview of pros and cons in blockchain implementation. It is clear that additional practical experiments will provide more information on this topic and give better base for decision.

Table 2. Advantages / challenges overview of blockchain in education implementation.

Advantages	**Challenges**
Student records verification	Price of development infrastructure
Reducing frauds in diplomas or previous education history	Fear of new technology among stakeholders
Decentralized online education and personal development	Skilled blockchain developers / providers
Distributed Learning platforms	Current technical limits / user experience
Copyright and privacy protection	"Felling" about technology from cryptocurrency point of view (lack of trust)
Ability to scale nationally, globally	
Smart contracts with automatic execution once terms are met	

Source: Gathered literature and author adjustment.

Currently it is possible to identify some main institutions / projects which are researching on optimal implementation of this technology in education. Naming a few could provide a good insight of situation to date:

a.) Open university (The Open University, 2021) – Knowledge Media Institute within Open University is doing (among other technologies) a research initiative on the Blockchain. Leading IT enhanced movement in United Kingdom, this institution is trying to standardize badging, certification and reputation on the Web with the use of the blockchain as a trusted ledger. This University has over 170.000 students and own e-learning solution which makes a good foundation for new tech experiments.

In order to make usage as simple as possible approach to the blockchain is synonymous with the Web (it should use own protocol and tools).

b.) MIT – in Cambridge, Massachusetts, department of MIT (Massachusetts Institute of Technology, 2020) developed The Open Standard for Blockchain Credentials – BlockCerts. Academic success grades, projects, transcripts and even diplomas are to be stored on a Blockcerts blockchain for immutable insight into individual's past academic history. In 2018. (MIT, 2018) more than 600 students have used this option making their diploma lasting forever in this blockchain system. Sony Global Education (Sony INC., 2018) – one of the global tech leaders made a partnership with IBM in Japan and created own blockchain platform. It enables various institutions to add/track individual academic achievements and other student information on a main ledger in order to maintain irreversible records on students who transferred or furthered their education.

c.) Disciplina (Disciplina.io, 2020), Estonian company uses blockchain to maintain a unified register of academic achievement and qualifications for universities. By assigning a score to someone based on his achievements or classes Universities can adjust, customize individualized learning plans. Student and Educator applications are tailored for corresponding user and solution is offered to public so that universities and students can become familiarized with the app.

4. Conclusion

From all research and gathered references it could be concluded that blockchain is a new technology which will sooner or later enter in everyday use of each individual. On the other side, it is clear that some objective obstacles are present which are making wider implementation at least a challenging task. Education as traditionally rigid field could use blockchain advantages, but the timeframe is seriously questionable. Modern technology as blockchain is should be more adopted before wider learning institution usage will be seen (like social network or webinars were in last decade).

Current research and case studies are theory oriented and practical solutions are still to be defined in the longer period of time. Also, more students, professors and administrative staff should be involved in such examples. Next step for this paper would be making a test model in local colleague where possibilities would be checked in detail as well as possible technology or social potential issues.

It is worth emphasizing that blockchain should not be perceived as a threat or replacement for educational institutions (similar to any other new technology which might appear). Innovative technpology must provide value across a wide range of educational processes; enabling learning to be more engaging and effective, cut down costs, improve trust, and allow greater security and privacy. Almost the same as when Web 2.0 was introduced main idea would be that technology on the long run should provide extra (spare) time for all education stakeholders which can be directed to (individual) student, learning excellence and modern knowledge needed for everyone in today's competitive market.

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