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FACULTY OF ECONOMICS - PRILEP

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SERBE

Contents

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EDITORIAL

Dimitar Nikoloski

Southeast European Review of Business and Economics (SERBE) is a peer reviewed academic journal published by the Faculty of Economics-Prilep, University "St. Kliment Ohridski"-Bitola, Macedonia. It has been founded on the rich academic and publishing heritage, including the Yearbook of the Faculty of Economics-Prilep and Proceedings from a number of international conferences. Based on this tradition, our intention is to publish original papers, which have not been previously published or submitted for reviewing to other journals.

The process of transition and the subsequent post-transitional development in Southeast Europe have engendered peculiar socio-economic phenomena that deserve comprehensive and systematic analysis. In addition, the global recession and its consequences has brought into question the validity of the existing paradigm and imposed need for applying alternative methodological approaches. In this context, the economics and other social sciences have faced challenging task for exploring the newly created complex social reality. The motivation for this journal arises from the necessity of solutions to actual business and economic problems by upgrading the existing theoretical framework and using a wide arsenal of alternative research techniques.

The aim of the journal is to provide opportunities for researchers to present their findings in the areas of business and economics and to assist in creation of alternative approaches for treatment of actual economic problems. Hence, we encourage experienced scholars, business practitioners as well as young researchers to submit their original work on various problems in the areas of business and economics.

In the second number of Southeast European Review of Business and Economics (SERBE) are presented selected papers from the XI International Conference "Digital transformation of the economy and society: Shaping the future" held on October 19-20, 2019 at the Faculty of Economics-Prilep.

ARE WE READY FOR CENTRAL BANK DIGITAL CURRENCY?

Andrej Ilievski, Evica Delova-Jolevska

ABSTRACT

In previous period of over a decade new cryptocurrencies are emerging, and it raises the question are we ready whether central banks should issue their own. Broader use of distributed ledgers technology (DLT) by new entrants or incumbents could have impact not only in payments, but also can be adopted by some financial market infrastructures, and more widely by other networks in the financial system and the economy as a whole. Because of these implications, it is highly recommended that central banks continue monitoring and analyzing the impact both in digital currencies and DLT. Central banks are actually examining two possible implications of issuing CBDC on the monetary policy and on the financial system. First, many of the risks that are linked with e-money and other forms of electronic payment instruments are also relevant for digital currencies. Second, the development of distributed ledger technology is an innovation with potential for applications beyond payments. Central bank digital currency (CBDC) has the capacity to transform all features of the monetary system and alleviate the way of conducting monetary policy in systematic and transparent way. CBDC are potentially almost costless medium of exchange, secure store of value, and stable unit of account. To achieve these prerequisite, CBDC would be account-based and interest-yielding, and the monetary policy framework would promote true price stability. In this paper, we analyze the key features of CBDC, focusing on basic design characteristics without looking at technical details and presenting progress in different countries that are exploring use-cases for state-based cryptocurrencies.

Keywords: Central bank, Digital currency

1. INTRODUCTION

> *"Trust is the raw material from which all types of money are minted"(Harari, 2011)*

Since ancient roman times, fundamental logic for the government-issued currency remains familiar to modern monetary economists. Namely, currency is a medium of exchange that facilitates economic and financial transactions, currency is used for storing value, and currency is a unit of account for the pricing of goods and services. Moreover, Roman jurist Paulus who served as chief legal advisor to the Roman emperor Severus Alexander (222-235 C.E.), realized that material, struck in due form by the mint, demonstrates its utility and title not by its

substance as such but by its quantity, so that no longer are the things exchanged both called wares but one of them is termed the price.

Today, nearly two millennia latter, we are witnessing dramatic changes in financial technology and creation of new business models, forms for performing transactions and crypto currencies with distributed ledger technology (DLT).This raises the question of how the central banks will response to these changes. One of the possibilities is to adopt these new technologies and that central bank issue digital currencies. In some way, central banks already issue "digital currency" because banks reserve balances now only exist in electronic form as liabilities of the central bank. But the question is whether such digital liabilities should be issued using new technology and be made more widely available to the general public. This is essential because applicability of central bank money will be a key success factor for the breakthrough of DLT. It is important to emphasize that CBDC are fundamentally different from the various forms of cryptocurrencies. The latter have been issued by private entities and in previous period since creation are subject of dramatic price volatility.

However, the new process and business logic may cause uncertainties compared with traditional setups and the central banks are aware of several of these challenges. Before issuing CBDC, central banks should take into consideration many aspects regarding impact on the payments system, on the privacy of transactions, on the private sector innovation, on the deposits held at commercial banks, on the financial stability of making a risk-free digital asset more widely available, on the transmission of monetary policy, on the technology which would be deployed in such a system and the extent to which it could be decentralized, but also what type of entities would exist in such a system and how they should be regulated. Some of the central banks are already doing research regarding this matter. The logic is that CBDC would be fixed in nominal terms, universally accessible, and valid as legal tender for all transactions. To achieve these prerequisite, CBDC would be account-based and interest-yielding, and the monetary policy framework would promote true price stability.

The rest of this paper is organized as follows. Section II gives a literature review. Section III provides a general and non-technical overview of the pros of CBDC. Section IV discusses the taxonomy and way of distribution of CBDC. Section V presents examples of countries exploring thepossibilities of CBDC. Section VI concludes.

2. LITERATURE REVIEW

More than a decade has passed from the last global financial crisis, and it is impossible to predict when the next crisis will be and how sever it can be. We have witnessed unprecedented monetary policies introduced by the central banks. Moreover, the effect from these policies is still subject of analysis.

Pfister and (Valla, 2017) summarize that two different approaches to central banking in the aftermath of the crisis: i) the first one, labelled as "new normal," monetary policy strategy that is broadened to encompass objectives as financial stability or full employment, so the inflation target is raised and large scale asset purchases are retained as a standard instrument for implementing monetary policy; ii) second approach, which they label as "new orthodoxy," central banks keep the same objectives but interest rates can be brought to unprecedented negative levels, thus making large scale asset purchases possibly unnecessary.

As shown in Figure 1, Central bank's liabilities in USA, Eurozone, UK and Japan raised after the last global financial crises.
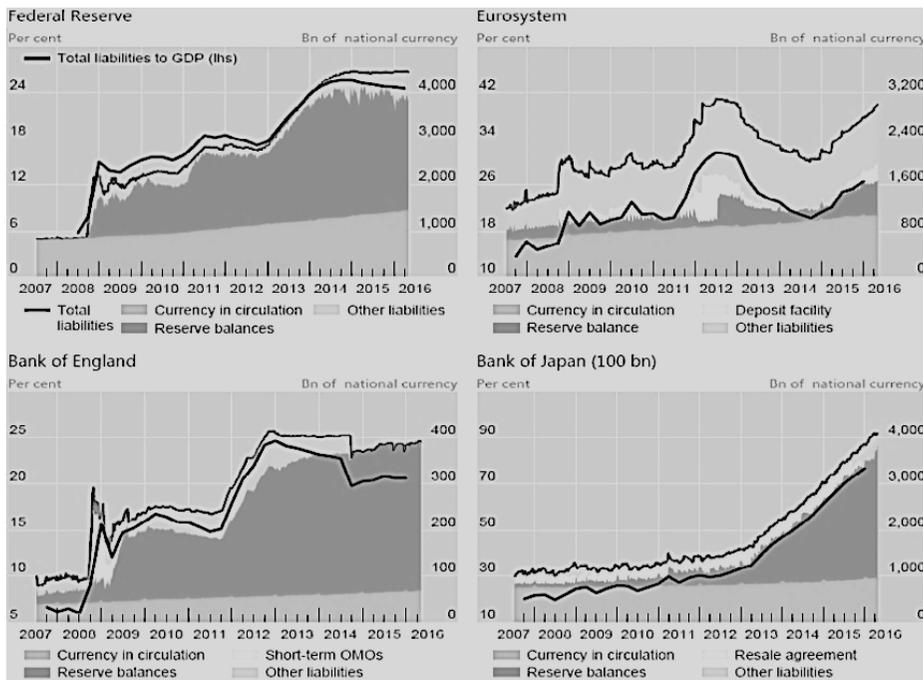
Figure 1: Central bank liabilities, (Borio and Zabai 2016)

(Borio and Zabai, 2016) argue that this development of unconventional monetary policy measures is risky and are likely to be subject to diminishing returns and even more short-term benefits may well give way to longer-term consequences, but the overall pressure to rely on increasingly experimental measures may at some point become too strong. Furthermore they argue that the balance between benefits and costs tends to worsen the longer this unprecedented monetary policies stay in place and exit difficulties and political economy problems may emerge, and at the end central banks' credibility and legitimacy could come into question.

Similar point of view is presented by (Agarwal and Kimball, 2015) who concludes that eliminating the zero lower bound will be with some costs, but those costs should be weighed against the both benefits of ending recessions and also

benefits of ending inflation. They summarize that key analytical point is that by and large the costs of inflation, but what is essential to wage cost of inflation relative to the unit of account.

(Fung and Halaburda, 2016) argues that key policy question for central banks is whether or not to issue its own digital currency that can be used by the general public to make payments, but in fact, there are two closely related questions: (i) Why might a central bank choose to issue its own digital currency? (ii) If a central bank were to issue its own digital currency, what should it look like? They conclude that addressing those questions will influence whether it is in the best interests of society for a central bank to issue its own digital currency and, if so, what considerations should be given to its design. But they emphasize that it is important to keep in mind that there are other aspects besides retail payment system efficiency that are important in the discussion of a central bank digital currency.

(Bordo and Levin, 2017) summaries that alternatively, the central bank might provide stimulus through credit subsidies or by financing public infrastructure spending or income transfers to households, but the viability of such coordinated monetary-fiscal policy measures could be highly dependent on the vagaries of politics and thus, the central bank might find itself with no real policy alternatives. They argue that by introducing CBDC with interest-bearing design and the obsolescence of paper currency would contribute to greater macroeconomic stability, because interest rate adjustments would no longer be constrained by any effective lower bound in response to severe adverse shocks. Moreover they conclude that lower bound has been a key reason why many central banks currently aim at positive inflation rates of 2 percent or more, whereas CBDC will essentially eliminate the need to maintain such an "inflation buffer" or to deploy alternative monetary policy tools such as quantitative easing or credit subsidies.

Bjerg (2017) argues that the contemporary question of CBDC is similar to the historical questions of the birth of paper money and we are witnessing invention of a new kind of money: electronic money. He also argues that like the evolution of paper money in its time, the innovation of electronic means of payment has made our economies more efficient and convenient and enabled entirely new forms of economic interaction, but the introduction and proliferation of electronic money has, however, also introduced entirely new forms of risk and instability in the economy, which are also comparable to the ones brought about by paper money. He concludes that question of 21st century monetary policy is how to respond to these new forms of risk and instability.

Furthermore, Fernández-Villaverde and Sanches (2018) recently performed analysis with assumption that paper currency becomes obsolete and the central bank does not produce any form of digital currency and all payments are made using privately-issued money (including virtual currencies). Under these assumptions, the analysis indicates that the economy may be subject to indeterminacy and that there may not be any equilibrium that exhibits stable prices. Their analysis finds that price stability can be assured by the issuance of CBDC in conjunction with an appropriate

monetary policy framework. This kind of concerns is also subject of interest of central bankers. Nicolaisen (2017), Deputy Governor of Norges bank in his speech at the Norwegian Academy of Science specifically warns about the risks associated with a scenario in which the Norwegian economy no longer has any functional legal tender.

Moreover, (Nicolaisens, 2017) emphasizes the importance of respecting social preferences for the form of money and choosing the direction our future monetary system and payment system will take requires not only economists, but also technologists, lawyers and other social scientists. And political decisions will ultimately need to be made by elected representatives. Nonetheless, these trends are not uniform across countries or types of households. The amount of cash in circulation is about 10 percent of GDP in the Eurozone and in Switzerland and exceeds 20 percent of GDP in Japan as shown in Figure 2.
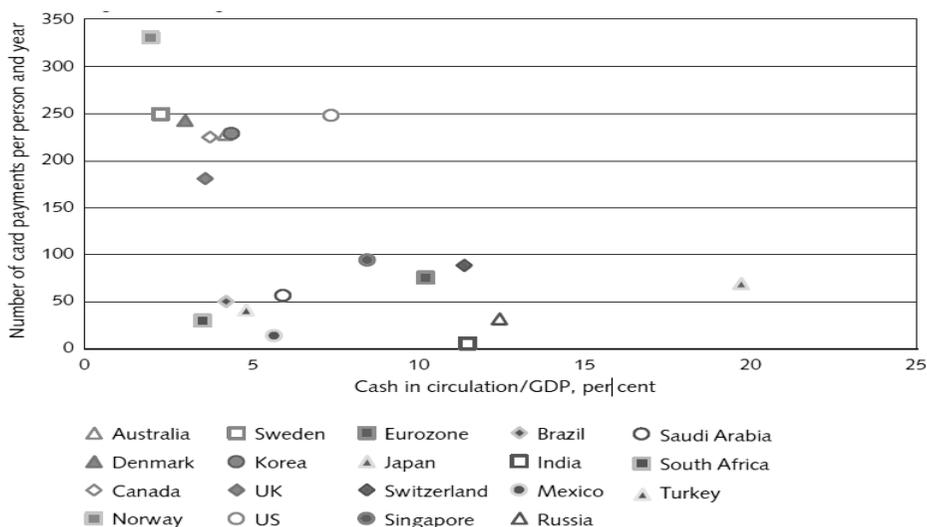
Figure 2: Usage of cards and cash in a selection of countries in 2013, (Segendorf and Anna-Lena, 2015)

According to (Sveriges Riskbank, 2016) survey, even in Sweden, about one-third of the households indicated that they would not be able to cope with the disappearance of cash. Those survey results also point to significant variations across demographic groups, with the greatest use of cash by the elderly and by individuals with relatively low levels of education and income.

3. WHAT ARE THE ADVANTAGES OF CBDC?

Economic volatility, sanction threats, "de-risking" strategies and import tariffs, are all realities of the current financial system - and some countries are more vulnerable. We may need an alternative. Initially central banks considered cryptocurrencies as a threat on their exclusive control of the supply of fiat currency,

but now central banks are exploring the options and trying to issue their own digital currency.

Yeager (1992) argues that for monetary regimes, the basic institutional choice concerns the unit of account - the unit in which prices are set, accounting conducted, costs and benefits estimated, and contracts drawn and that adopting a fiat currency as unit of account implies deciding on some principles for its management, but that adoption still cannot achieve some detailed pattern of economic outcomes. (Friedman, 1960) argues that government-issued money should bear the same rate of return as other risk-free assets. These two goals-that is, a stable unit of account and an efficient medium of exchange-seemed to be incompatible due to the impracticalities of paying interest on paper currency, and hence (Friedman, 1948) advocated a steady deflation rather than price stability.

But is it possible achievement of both goals (stable unit of account and an efficient medium of exchange) by using CBDC having in mind that (Bordo et al, 2007) concludes that true price stability was not achieved during the classical gold standard era, but rather, the general price level exhibited substantial fluctuations and persistent drift due to shifts in the relative supply and demand for gold?

Bordo and Levin (2017) argues that with CBDC it will be possible for central banks to aim there policies towards true price stability and this would be substantively different from the current practice of inflation forecast targeting and that by contrast, under a price level target, consumer prices would still exhibit transitory fluctuations but monetary policy will ensure that the aggregate price level returns to its target over time. They also argue that households and businesses would be able to formulate their plans with confidence because the cost of a representative basket of consumer items (as measured in terms of the CBDC) and such stability could be particularly beneficial for lower-income households and small businesses, which typically have little or no access to sophisticated financial planning advice or complex financial instruments that can help insure against such risks.

Barrdear and Kumhof (2016) estimated that on macroeconomic level the productivity gains from adopting CBDC would be similar to those of a substantial reduction in distortionary taxes and could serve as a practically costless medium of exchange. Moreover, (Dyson and Hodgson, 2017) argue that in the time in financial crisis funds could be deposited directly into the CBDC accounts of lower-income households, thereby cushioning their purchasing power from the effects of the downturn as well as from the temporarily negative level of the CBDC interest rate.

He et al. (2017) conclude that the introduction of CBDC would facilitate more rapid and secure settlement of cross-border financial transactions. They also argue that a CBDC could overcome the coordination failure of inability to agree on a single new technological standard for electronic payments.

Regarding the discouraging tax evasion, money laundering, and other illegal activities, the potential benefit ofCBDC, (Rogoff, 2015) concludes that given the

role of paper currency (especially large-denomination notes) in facilitating tax evasion and illegal activity, taking into consideration the continuous and persistent and perhaps recurring problem of the zero bound on nominal interest rates, it is appropriate to consider the costs and benefits to a more proactive strategy for phasing out the use of paper currency and taking into consideration of relentless technological advance era of paper currency era is coming to an end.

4. TAXONOMY AND DISTRIBUTION OF CBDC

The (Committee on payments and market infrastructure, 2015) has identified three key aspects relating to the development of digital currencies: i) The first is the assets (such as bitcoins) featured in many digital currency schemes and these assets typically have some monetary characteristics (such as being used as a means of payment), but are not typically issued in or connected to a sovereign currency, are not a liability of any entity and are not backed by any authority and furthermore, they have zero intrinsic value and, as a result, they derive value only from the belief that they might be exchanged for other goods or services, or a certain amount of sovereign currency, at a later point in time; ii) The second key aspect is the way in which these digital currencies are transferred, typically via a built-in distributed ledger and this aspect can be viewed as the genuinely innovative element within digital currency schemes; iii) and the third aspect is the variety of third-party institutions, almost exclusively non-banks, which have been active in developing and operating digital currency and distributed ledger mechanisms.

Bech and Garratt (2017) use Venn diagram to illustrate so called "money flower". The four-ellipse version as shown in Figure 3, which they call the "money flower", shows the two potential types of CBDC (retail and wholesale) fit into the overall monetary landscape.

Bech and Garratt (2017) actually establish new taxonomy of money properties: issuer (central bank or other); form (electronic or physical); accessibility (universal or limited); and transfer mechanism (centralized or decentralized, i.e., peer-to-peer). They argue that this taxonomy reflects what appears to be emerging in practice and distinguishes between two potential types of CBDC, both of which are electronic: central bank-issued and peer-to-peer. One is accessible to the general public (retail CBDC) and the other is available only to financial institutions (wholesale CBDC).
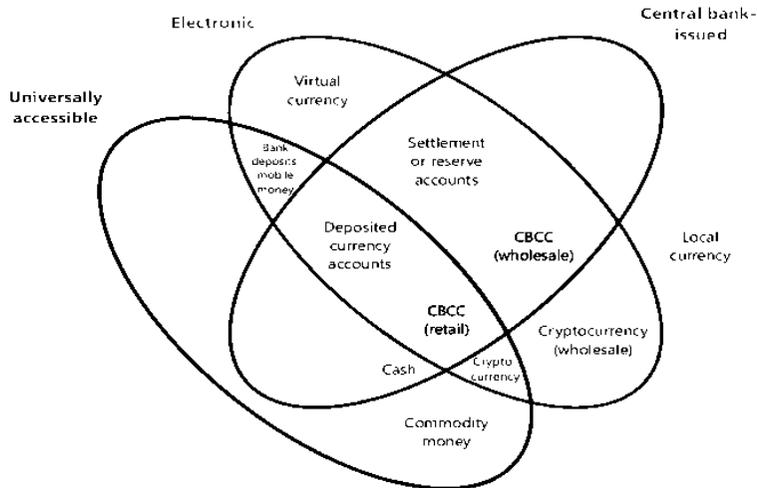
Figure 3: The money flower: taxonomy of the money (Bech and Garratt, 2017)

And now we come to one essential question that is how and to whom it would distribute its digital currency? (Barrdear and Kumhof, 2016) are presenting two models as a solution: i) In the first, the central bank offers to exchange its non-equity liabilities at par against digital currency to commercial banks and the digital currency would then be "retailed" through these banks to other banks and non-banks including individuals, corporations, wallet providers and operators of the payments system; ii) The second model of distribution would have the central bank making its digital currency available not only to banks, but also to select other financial institutions and non- financial institutions. In the first model central bank would avoid the need to deal with technical difficulties of end-user usability and platform compatibility. In the second model central bank will be involved more closely into operating the system and may raise privacy concerns, especially if transactions are validated by multiple.

5. EXAMPLES OF COUNTRIES EXPLORING USE CASE FOR CBDC

A. *The Sverges Riskbank - e-krona project*

According to central bank of (Sweden Riskbank, 2019) the use of banknotes and coins is declining in society and at the same time, technological advances with regard to electronic money and payment methods are proceeding rapidly. The Riksbank is therefore investigating whether Swedish krona need to be made available in electronic form, the so-called e-krona.

Boel (2016) concludes that technological innovation could potentially lead to a diminished lending role from the traditional banking sector if phenomena such as

peer-to-peer lending and cryptocurrencies become mainstream. Furthermore, at the same time, the role of central banks could change in a world without cash and regulators and central banks therefore need to understand how these innovations could potentially transform the banking sector as we know it today and fundamentally change the traditional channels through which monetary policy affects the economy.

Söderberg(2018) submerses that e-krona, if it becomes a reality, would be issued and managed by the central bank, which is a public authority, in a way that guarantees that it fulfils the fundamental functions that are required of money and it would therefore be based on the chart list and functionalist principles that are now the basis for our monetary system. Moreover, crypto-assets enthusiasts in many cases lack confidence in the ability of states and central banks to manage money and it is therefore very important to make a clear distinction between crypto-assets and central bank issued digital currencies - the former are usually issued in a decentralized process with no formal issuer, while the latter are issued by national states and managed by central banks and the principles for maintaining confidence in a potential e-krona and a crypto-asset are thus diametrically different.

B. The Monetary Authority of Singapore - Project Ubin

(The Monetary Authority of Singapore, 2017) project Ubin, under management of the Monetary Authority of Singapore (MAS) and in collaboration with major financial institutions (the Association of Banks in Singapore) carried out pilot studies of inter-bank transactions using digital ledger technologies, and developed three models for decentralized inter-bank payment and settlements.

To quote (The Monetary Authority of Singapore, 2017): "the SGD-on-ledger is a specific use coupon that is issued on a one-to-one basis in exchange for money. The coupons have a specific usage domain – in our case for the settlement of interbank debts - but no value outside of this. One is able to cash out by exchanging the coupons back into money later ... SGD-on-ledger has three useful properties that make it suited to our prototype. First, unlike money in bank accounts, we do not receive interest on the on ledger holdings. The absence of interest calculations reduces the complexity of managing the payment system. Second, to ensure full redeem-ability of the SGD-on-ledger for money, each token is fully backed by an equivalent amount of SGD held in custody. This means that the overall money supply is unaffected by the issuance of the on ledger equivalents since there is no net increase in dollar claims on the central bank. Third, SGD-on-ledger is limited use instruments and can be designed with additional features to support the use case - such as security features against misuse."

Datta (2019) concludes that the three highlighted properties from the project Ubin emphasize the importance of responsibly using blockchain without creating instability while solving actual pain points of digital financial activities that exist with legacy infrastructure: particularly that the processes are unnecessarily complex with respect to the functionalities provided, making the solutions inefficient (slower and/or expensive). Such a tokenized approach also allows a natural integration of

the currency with other workflows and functionalities that may be carried out over a multi/all-purpose blockchain platform.

C. Bank of Canada - Project Jasper

Chapman el al. (2017) summarizes that the Project Jasper provided vital insights into how a central bank and participating financial institutions can complete interbank payments on a distributed ledger and also offer an understanding of the functioning of a wholesale payment system using different DLT platforms and how modern payment system features, such as queues, could be incorporated to increase efficiency by reducing collateral needs. They also argue that developing a working prototype improved awareness of potential risks associated with DLT-based systems and how they can be mitigated. Moreover they argue that there are two key challenges in developing Project Jasper: i) establishing how to transfer value and ii) how to most efficiently settle payments with the minimum amount of digital depository receipt or liquidity.

Furthermore, (Chapman el al., 2017) concludes that the principles for Financial Market Infrastructure require that financial market infrastructures settle in central bank money whenever practical and available and that this usually means settling using accounts at the central bank. They explain that to do this, the concept of a digital depository receipt was used to represent Bank of Canada deposits and that it's a digital representation of currency that is issued by the Bank of Canada.

(Garratt, 2017) argues that this method used by Bank of Canada could be one of the approaches for a wider use of central bank money in the future and that digital depository receipts are issued in the system by the Bank of Canada and are backed one for one by cash pledged to the Bank by participants and also the exchange of DDRs for central bank money means there is no increase in money circulating in the banking system.

Actually, the digital depository receipts are used by participants in the system to exchange and settle interbank payments. The processing cycle of Project Jasper achieved ultimate settlement finality on the books of the Bank of Canada after exchanging digital depository receipts with the Bank of Canada for Canadian dollars transferred into their respective settlement accounts. For all intents and purposes, these digital depository receipts functioned as cash in the system.

Bech and Hobijn (2007) argue that historically speaking, interbank payments were settled using systems that conduct end-of-day netting between participants, but as volumes and values increased in these systems, central banks became concerned about the risks inherent in netting. In response, most central banks have opted for the implementation of real-time gross settlement systems. They conclude that with these systems, payments are processed individually, immediately and with finality throughout the day.

Phase 1 of Project Jasper was implemented as a pure real-time gross settlement system with every individual payment on the ledger being prefunded by

digital depository receipts in the participant's wallet. Real-time gross settlement system systems eliminate settlement risk at the cost of an increased need for liquidity. Liquidity demands on real-time gross settlement systems can be enormous, given the large values that are settled in these systems-typically up to one-fifth of a country's gross domestic product on a daily basis. To make real-time gross settlement systems less liquidity-demanding, operators around the world have implemented liquidity-saving mechanism. The most effective ones are those that support settlement by periodically matching offsetting payments that have been submitted to a central payments queue and settling only the net obligations. However, offsetting algorithms cause delay in settlement, which is unacceptable for some types of payment. Banks therefore need a way to make these time-critical payments.

Phase 2 of Project Jasper explored the possibility of giving banks the choice of entering payments for immediate settlement or into a queue for netting and deferred settlement. Project Jasper appears to be the first public instance of implementing a liquidity-saving mechanism algorithm on a distributed ledger platform.

D. Cooperation between projects

(Bank of Canada, Bank of England and The Monetary Authority of Singapore, 2018) jointly published a report which assesses alternative models that could enhance cross-border payments and settlements. The report examines existing challenges and considers alternative models that could in time result in improvements in speed, cost and transparency for users. This report provides an initial framework for the global financial community to assess cross-border payments and settlements in greater depth. Specifically, it discusses how a variety of payment models could be implemented, from both a technical and non-technical perspective. The MAS and Bank of Canada are now collaborating to develop possible technical solutions to the proposed payment models.

(Bank of Canada, Bank of England and The Monetary Authority of Singapore, 2018) report has three main conclusions: i) the first is to conduct further research and experimentation to better evaluate the different models, in particular the hypothesis that a holistic approach to infrastructure change can deliver more far-reaching benefits than incremental improvements to the current model and this could include the creation of a technical proof-of-concept solution aimed at assessing the delivery of future-state capabilities;ii) the second is to consider further the policy implications of some of the more radical changes outlined in this report, particularly the impacts on the transmission mechanisms for monetary policy, whether broader access to central bank money settlement could drive improvements without large-scale infrastructure change, and the role of the RTGS operator in the future state, and iii) while this report has focused on change driven through revolution in the central payment infrastructures, further thinking could be done on how policy-makers and industry could work to get her on private sector innovation to address, in the shorter term, thechallenges faced by users of cross-border payments.

6. CONCLUSIONS

Although analyzing consequences of adopting a CBDC regime faces the problem that there is no historical experience, in this paper we presented the key features of CBDC, focusing on basic design characteristics without addressing the technical details and presenting progress in different countries that are exploring use-cases for state-based cryptocurrencies. Furthermore, we discovered that central banks are already exploring logistical and technical detail considering CBDC and even exploring the models for mutual cooperation, which will eliminate the future issues of inability to agree on a single new technological standard.

Central banks have to decide on whether to be passive and inertial or to be proactive regarding adoption of CBDC. In the passive approach central bank monitors development in the field of Fintech and utilize experiences of the other central banks pioneers in CBDC. As it might seem prudent, this brings several hidden risks taking into consideration the latest development in Fintech.

Finally, our theoretical analysis made an effort to answer the question whether we are ready for CBDC. Namely, the process of introducing CBDC has already begun and has the capacity to transform all features of the monetary system and alleviate the way of conducting monetary policy. The main advantages of CBDC are that they have the potentially of being almost costless medium of exchange, secure store of value, and stable unit of account. But, with so much still to be learned about the possibilities of digital currencies and blockchains, a CBDC still appears to be a radical proposition that brings significant risks for the rest of the financial system. Also, we suggest that decision on adoption of CBDC should consider not only economic, but also social, technological, legal and other aspects.

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THE FACTORS OF LABOUR PRODUCTIVITY IN THE REPUBLIC OF NORTH MACEDONIA

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ABSTRACT

Labour productivity as a single factor measure represents the total volume of output produced per unit of labour during a given time reference period. Labour productivity affects various stakeholders in the society such as workers, companies and the government. Hence, determining the factors that affect the labour productivity represent a challenging task. The aim of this paper is to identify the industries that are drivers of the labour productivity growth in the Republic of North Macedonia and to shed light on its main determining factors.We find that with respect to labour productivity the leading industries in the Macedonian economy are the following: Electricity, gas, steam and air conditioning supply; Mining and quarrying; Financial and insurance activities; Information and communication. As potential factors that affect the labour productivity we consider: the consumption of fixed capital, the average net wage, workforce characteristics, jobs' characteristics and firms characteristics at industry level. The empirical findings show that industries with higher capital intensity and higher average net wage experience the highest labour productivity. In addition, temporary work arrangements, more experienced workforce and higher shares of private companies in a given industry are associated with better performance in terms of labour productivity. Finally, the analysis is used as a basis for defining appropriate policy measures for increasing the labour productivity by using the potentials of the ICT that would lead to greater competitiveness and economic growth.

Keywords: Labour productivity, wages, employment, industry

1. INTRODUCTION

The higher level of production in a given country can be attributed either to increased employment or to more effective work by those who are employed. The latter effect can be described by the indicators on labour productivity. Labour productivity is an important economic indicator that is closely linked to the economic growth, competitiveness and living standard within an economy. Higher labour productivity means to produce more goods and services with the same amount of resources or to produce the same level of goods and services with fewer resources.

Labour productivity affects various stakeholders such as workers, companies and the government. For workers increased productivity can translate to higher

wages and increased living standard, while in the long term would lead to job creation and lower risk of unemployment. For businesses, increased productivity brings higher profit, greater competitiveness and opportunity for more investment. For the government, increased productivity results in higher tax revenues and better provision of public good and services.

At an industry level, labour productivity growth is important to allow the industry to compete with other sectors of the economy for resources and maintain international competitiveness. The labour productivity is particularly important in developing countries where there still exists a large room for improvements in a number of industries. Hence, determining the factors that affect the labour productivity and productivity growth on an industry level represent a challenging task for the academics and policy makers.

The understanding of the driving forces behind the labour productivity is important for formulating policies to support economic growth. Application of an effective economic policy among other things, involves increasing the productivity, which can be achieved through a variation of as many productivity determinants as it is feasible and economically beneficial. It is important to note that some sectors of the economy traditionally have low productivity growth but are important to aggregate productivity growth. Consequently, government policies, which only focus on sectors exhibiting productivity growth, could be detrimental for the productivity growth as a whole.

Generally, the productivity improvements are not spread evenly across the economy. For example, computer hardware productivity has been rising dramatically as the price of microprocessor chips has plunged relative to their ability to perform more instructions per second. In addition, the information and communication technology (ICT) have raised the productivity or output of the people/companies using those technologies. It is a common view that the ICT industry plays a critical role in increasing the productivity and busting the economic development of a given country. Thus, increasing the ICT use by the business entities in general, would increase the labour productivity in other industries as well.

The problems of sub-optimal labour market outcomes in post-transition countries such as the low-productivity employment deserve further scientific attention due to their enormous social implications. In this context, besides weak state institutions, deficiencies in investment policies and business regulation, the low productivity continues to pose serious structural challenges (World Bank, 2019). The problem of stagnant economic growth in the Republic of North Macedonia has been partly attributed to inability for creation of high-productivity jobs (Mojsoska-Blazevski and Kurtishi, 2012). However, the issue of labour productivity and its determinants in the Republic of North Macedonia has been analysed only sporadically. For instance Trpeski and Cvetanoska (2018) have studied the determinants of agricultural labour productivity, while more

comprehensive analysis of labour productivity in different sectors can be found in Trpeski (2011).

Having in mind the above considerations, the aim of this paper is to identify the industries that are drivers of the labour productivity growth in the Republic of North Macedonia and to shed light on its main determining factors. Hence, the paper is structured as follows. Section 2 provides the basic definitions and theoretical background about the productivity determinants. In Section 3 is described the data used for the empirical analysis. In Section 4 is performed the empirical analysis by using panel data at industry level. Finally, in Section 5 are formulated appropriate policy measures for increasing the labour productivity that would potentially lead to greater competitiveness and economic growth.

2. THEORETICAL BACKGROUND

Productivity is generally defined as a ratio of volume measure of output to a volume measure of input use. Alternatively, productivity is expressed as quantity of produced goods (output) divided by the units of production factors used (input).The productivity measures can be classified as single factor or multifactor productivity measures. Labour productivity as a single factor measure represents the total volume of output produced per unit of labour during a given time reference period. It is expressed as output per worker or output per hour worked. Labour productivity only partially reflects the productivity of labour in terms of the personal capacities of workers or the intensity of their effort. The ratio between output and labour input depends to a large degree on the presence of other inputs.

According to the OECD (2001), there are various productivity concepts of which the following two concern the labour productivity: Labour productivity based on gross output and Labour productivity based on value added.

The labour productivity based on gross output shows the time profile of how productively labour is used to generate gross output. When measured as gross output per unit of labour input, labour productivity growth also depends on how the ratio of intermediate inputs to labour change. Gross output based labour productivity traces the labour requirements per unit of physical output. It reflects the change in the input coefficient of labour by industry and can help in the analysis of labour requirement by industry. The advantage of this concept can be viewed in the ease of measurement and readability. In particular, the gross output measure requires only prices indices on gross output, not on intermediate inputs as is the case for the value added based measure.

The labour productivity based on value added shows the time profile of how productively labour is used to generate value added. In comparison with the previous concept, the growth rate of value added labour productivity is less dependent on any change in the ratio between intermediate inputs and labour. The purpose of using this concept is to analyse the micro-macro links such as the industry contribution to economy wide labour productivity and economic growth.

From a policy perspective, value added based labour productivity is important as a reference statistic in wage bargaining.

Several theories within the scope of the labour economics can be used for explaining the potential factors

As potential groups of factors affecting the labour productivity are considered the following: (1) the quality of the labour force, (2) the amount of capital goods employed and, (3) the efficiency with which labour, capital and other inputs are combined in the production of final goods and services (McConnell et al., 2003). Namely, improvements in output per unit of labour may be due to increased quality and efficiency of the human factor as well as other factors such as capital intensity, institutions and other conditioning variables.

The quality of labour depends on its education and training, its health and vitality, and its age-gender composition. With this regard, we assume that better educated and better trained workforce at industry level can produce more output than a less educated and/or inadequately trained one. The increase in labour quality in turn generates self-reinforcement effects through the rise of real wages. Namely, enhanced earnings allow workers to improve their health and education, which leads to further improvements in labour quality and productivity. Alternatively, according to the efficiency wage theory, the wage rate above the market clearing level will also exert an increase of labour productivity.

Regarding the quantity of physical capital, we assume that the productivity in any given industry will depend on the amount of capital equipment used. For instance, IT equipment facilitates the expansion of business activities and eases the information transactions between employees and managers which potentially leads to increase of labour productivity.

Finally, increased efficiency encompasses: technological progress, greater specialisation as the result of scale economy, the reallocation of labour from less to more productive uses and, changes in institutional, cultural and environmental setting and its public policies.

Several theories can be used to explain the potential determinants of labour productivity. According to the efficiency wage theory, a firm would benefit from paying workers a wage higher than their marginal revenue product in order to recruit, retain or motivate workers. Furthermore, the endogenous growth theory argues that economic growth is generated within a system and not external forces. Hence, the investment in human capital, research and development, knowledge will lead to economic and productivity growth. The human capital theory emphasizes that skills and education increase the workers' technical efficiency and productivity. Finally, the neoclassical growth theory pays attention to the process of capital accumulation and argues that aggregate savings would act as a finance addition to the national capital stock. Therefore, FDI increases the capital stock by financing capital formation and thus enhances the productivity of the host country (Snowdon et al., 1994).

Closely related to the productivity growth in a given market economy is the concept of 'creative destruction'. This term is attributed to the famous economist Joseph Schumpeter who defined creative destruction as continuous process by which emerging technologies push out the old, thus increasing the productivity. As a consequence, we are witnessing a constantly changing structure of the economy. Old industries and firms which are no longer profitable close down enabling the resources to move into more productive processes. Creative destruction means that the company closures and job losses are good for the long-term well-being of the economy and can be seen from both a negative and positive perspective. For instance, the recent trend of developing IT technologies has begun to alter the manner in which businesses creates economic value and contributes to speeding up the process of creative destruction.

The process of creative destruction has been particularly pronounced during the transition process (De Loecker and Konings, 2003). According to Blanchard (1997) in the context of labour market performance, the process of transition has been mainly led by two driving forces: ownership restructuring and sectoral reallocation. These processes respectively assume a large-scale transformation of state owned firms into privatised ones and, a reallocation of a substantial part of the labour force from the manufacturing and agricultural sectors towards the expanding service sector. The later phase of transition, when the major restructuring process of the state sector finished, is represented by a so-called 'balanced path'. The main driving force of labour force adjustment in this phase is the private sector where the major entrants into new employment come from the pool of the unemployed.

3. DATA

The data used for the empirical analysis is taken from the officially published reports of the State Statistical Office of the Republic of North Macedonia for the period 2011-2016. More precisely the labour productivity by industry is assessed according to the production approach in calculation of the Gross Domestic Product (GDP). Data sources used for GDP calculations are the annual financial reports from the Central Register, data from the annual statistical surveys, data from the Ministry of Finance, the Public Revenue Office and other sources. Data on the sources of value added and the cost structure of the GDP by production approach at current prices are presented by sectors according to the NACE[1] Rev.2 classification. The complete list of the main economic activities according to NACE Rev.2 classification is presented in Appendix 1.

Gross Domestic Product (GDP) at market prices is the final result of the production activity of the resident producer units and it is the sum of gross value added of the various institutional sectors or the various activities at basic prices plus

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[1]NACE is abbreviated from Statistical classification of economic activities in the European Community.

value added, import duties less subsidies on products. Gross value added at basic prices is the basic category of GDP. It represents the balance between gross output and intermediate consumption. On the other hand, gross output is considered the value of goods and services produced in the course of one year, regardless of whether or not the whole quantity is sold or partly added to stocks.

Total employment in accordance with the European system of accounts methodology covers all persons either employed or self-employed engaged in some productive activity that falls within the production boundary of the system. Employees are defined as all persons who, by agreement, work for another resident institutional unit and receive remuneration. In accordance with the National Account concepts, the total number of employees covers the number of employees from the annual financial reports, and the adjusted number of non-registered employees by using Labour Force Survey data.

Self-employed are defined as persons who are sole owners or joint owners in unincorporated enterprises. The compensation of employees for the self-employed represents mixed income. Based on this definition, the category of self-employed includes people who run their own business, persons who pay annual lump-sum income tax to the Public Revenue Office, unpaid family workers, and persons who do not have a formally registered business and are estimated based on the Labour Force Survey.

Data on estimated employees and self-employed are obtained by comparison with Labour Force Survey data according to the domestic concept i.e. including non-residents working in North Macedonia and excluding residents who work abroad. The estimates are made by using the method of balancing the number of employees from different sources that are the basis for estimating the non-observed economy. Employment data are measured in number of persons in employment.

4. EMPIRICAL ANALYSIS

The first part of the empirical analysis consists of presenting main trends in the labour productivity in the Republic of North Macedonia at industry level. In our empirical analysis we do not include Real estate activities because they encompass imputed rents of owner-occupied dwellings. In addition, Activities of households as employers and Activities of extra-territorial organisations and bodies are not taken into account due to the fact they are outside the SNA[2] production boundary. The labour productivity at industry level is assessed according to the production approach in calculation of the Gross Domestic Product (GDP) taken from the officially published reports by the national statistical offices. According to the OECD Manual on measuring productivity (2001), we separately consider two

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[2]SNA stands for System of National Accounts.

labour productivity concepts: Labour productivity based on gross output and Labour productivity based on value added.

In order to compare the labour productivity among different industries, we further analyse the average labour productivity at industry level. Based on value added by industry in the Republic of North Macedonia the average labour productivity per worker for the period 2011-2016 (in million denars) is presented on Figure 1.

Figure 1 Average labour productivity in North Macedonia (2011-2016)
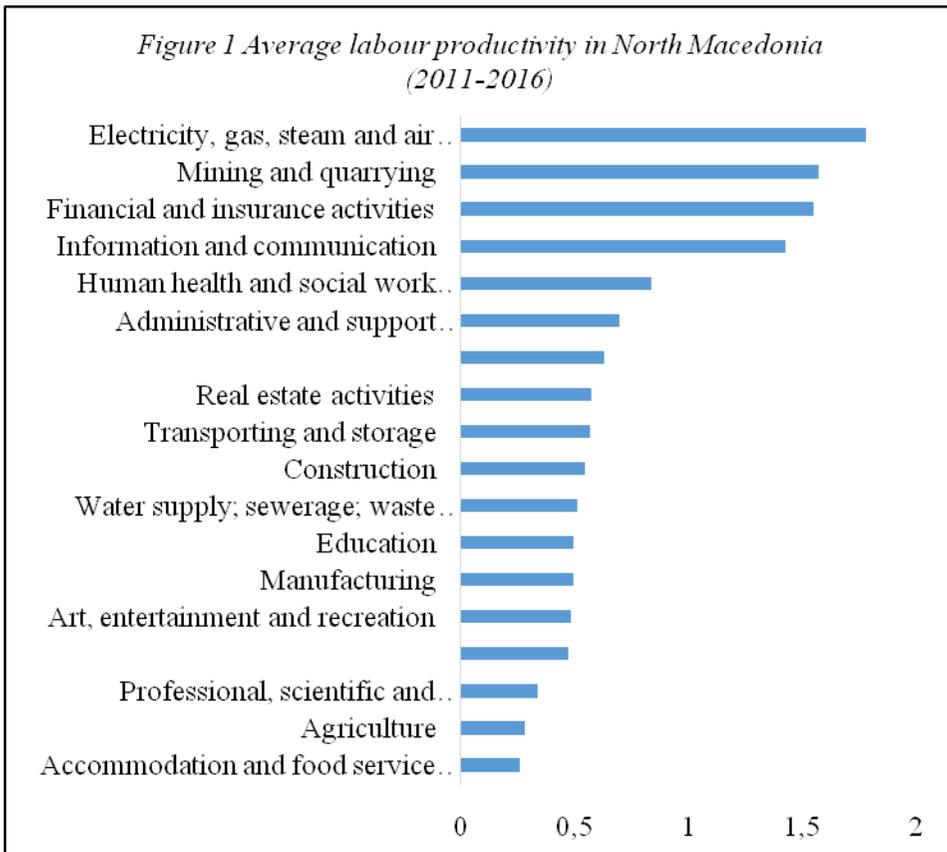
From Figure 1, we can notice that the following four industries have particularly high labour productivity: Electricity, gas, steam and air conditioning supply; Mining and quarrying; Financial and insurance activities; Information and communication. In contrast, the lowest labour productivity levels are characteristic for accommodation and food service activities, agriculture and professional, scientific and technical activities.

In the second part of the empirical analysis we separately estimate alternative econometric models in order to identify statistically significant factors of labour productivity. Among the factors that can potentially influence the labour productivity we consider the following: Capital intensity; wage level; workforce characteristics, jobs' characteristics and firms' characteristics. As typical workforce

characteristics we consider the education, age and gender composition at industry level. The jobs' characteristics depends on the type of employment arrangement (temporary/contract) and number of hours (part-time/full-time). Finally, firm's characteristics depends on the type of ownership and size of the companies.

Increased physical capital of a firm, generally lead to increased labour productivity. In our analysis we use the consumption of fixed capital during the accounting period as a component of GDP and it is defined as a decrease in the current value of producer's fixed assets due to the physical use, obsolescence and accidental damages. When calculating GDP, the depreciation value is calculated based on the data from the annual reports of legal entities. The amount of physical capital is divided by the number of employees in each industry in order to express it per employee. The relationship between the labour productivity and the consumption of fixed capital per employee is presented on Figure 2.

Figure 2. Relationship between labour productivity and consumption of fixed capital
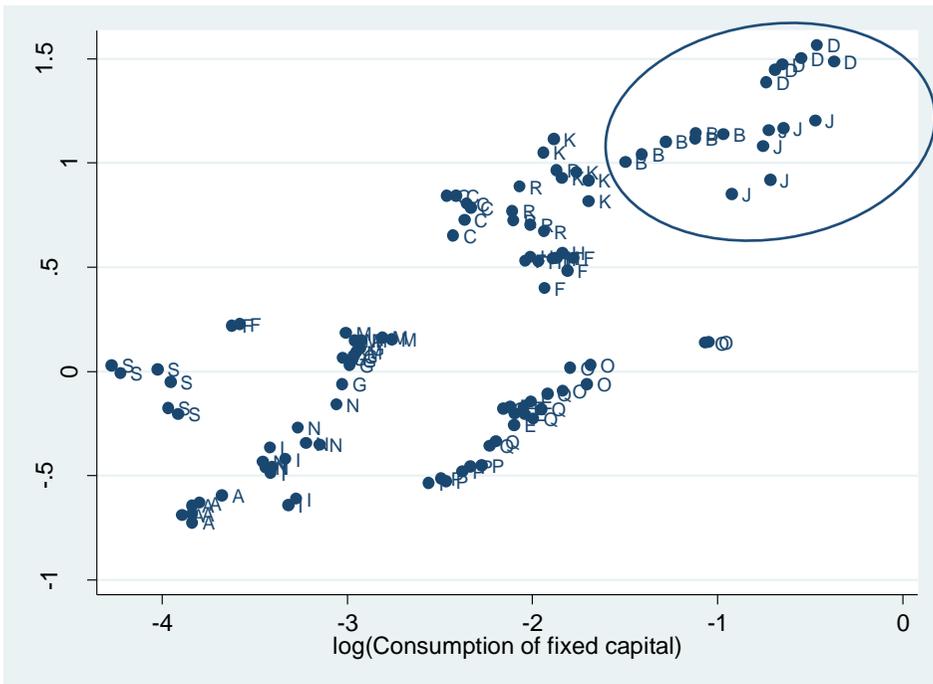
The impact of the wage rate above the market clearing level according to the wage efficiency theory will increase labour productivity. There are various reasons for this phenomenon that can be generally explained by two models within the framework of the efficiency wage theory (Schlicht, 2016). For instance, the incentive-driven model states that as wage level increases, workers will be more motivated to keep their jobs and will therefore try to increase the level of their productivity. On the other hand, the gift exchange model is based on the assumption

that high wages change the relationship between an employer and an employee in the way that the employee will be more attached to the employer and will try to increase his own productivity. The relationship between the labour productivity and the average net wage is presented on Figure 3.

Figure 3. Relationship between labour productivity and average net wage
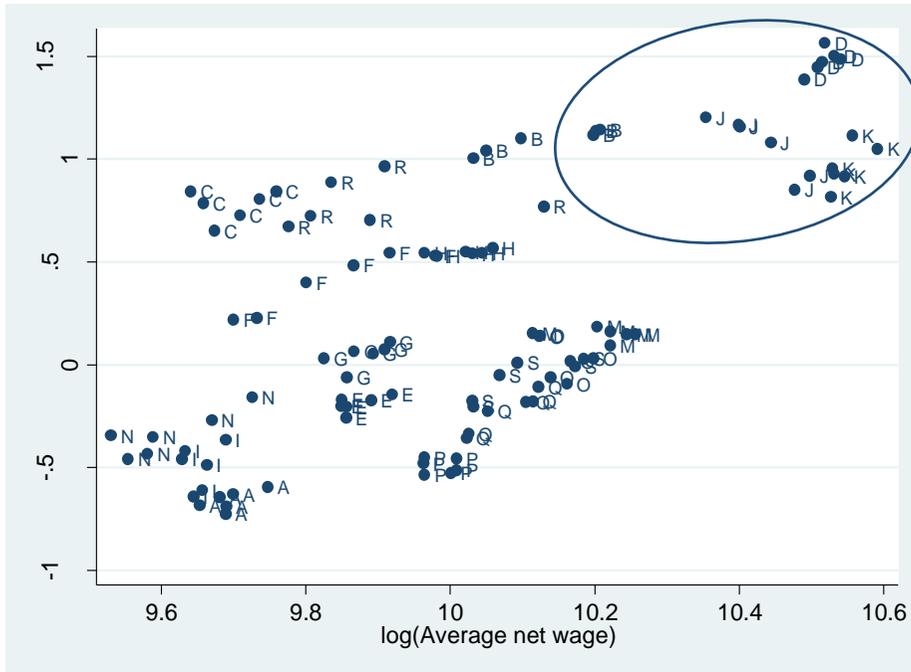
The effects of education, age and gender at industry level are estimated as percentage shares of workers with higher education, youth (younger than 29) and female respectively. In this way, we attempt to assess the impact of human capital on labour productivity which is widely recognised in the economic literature (Ehrenberg and Smith, 2009). According to the human capital theory, human capital contributes to the output just like other factors of production and also through technological change.

The work arrangement characteristics are assessed separately by the shares of workers with temporary and part-time contracts at industry level. As a part-time employee is considered an employed person that works fewer hours per week than a full-time employee, the latter being typically employed for 40 hours. The temporary employment is contractual employment arrangement between one employer and one employee characterised by a limited duration or a pre-specified event to end the contract. Temporary employment is sometimes called 'contractual', 'interim', 'casual' or 'freelance' and it has been recently related to jobs associated with the 'gig economy'.

Finally, ownership and size as the most important firms' characteristics are taken into consideration by separately estimating the shares of private and small

firms at industry level. In this context, many economists believe that productivity and efficiency in the private sector is higher than in the public sector. Namely, employment of more skilled workers by private enterprises makes them superior in terms of labour productivity. Regarding the firm size, the theory supports the view that small and medium sized enterprises (SMEs) are less cost efficient than the larger one due to economies of scale, product differentiation, lack of R&D expenditures and lack of vertical integration.

In order to estimate the labour productivity model we use a panel data covering the industries according to the NACE rev.2 classification during the period 2011-2016. The model is expressed as follows:

$$lnLP_{it} = \alpha_0 + \alpha_1 lnK_{it} + \alpha_2 lnW_{it} + \alpha_3 Higher_{it} + \alpha_4 Young_{it} + \alpha_5 Female_{it} + \alpha_6 Temp_{it} + \alpha_7 Part_{it} + \alpha_8 Private_{it} + \alpha_9 Small_{it} + u_{it}$$

where,

$\ln LP_{it}$ is the logarithm of average labour productivity expressed either as gross output or value added per employee in industry *i* and year *t*;

lnK_{it} is the logarithm of average capital intensity per employee in industry *i* and year *t*;

nW_{it} is the logarithm of average net wages in industry *i* and year *t*;

$Higher_{it}$ is the share of employed with higher education in industry *i* and year *t*;

$Young_{it}$ is the share of youth employed in industry *i* and year *t*;

$Female_{it}$ is the share of female employed in industry *i* and year *t*;

$Temp_{it}$ is the share of employed in temporary jobs in industry *i* and year *t*;

$Part_{it}$ is the share of employed in part-time jobs in industry *i* and year *t*;

$Private_{it}$ is the share of employed in private companies in industry *i* and year *t*;

$Small_{it}$ is the share of employed in small companies in industry *i* and year *t*;

The results of the estimated model of labour productivity based on gross output with fixed effects are presented in Table 1. In order to check the robustness of our model, we present several specifications. In the first specification as explanatory variables are included the capital intensity and average net wage. In the second specification are added the variables related to workforce characteristics such as: level of education, age and gender. In the third specification are added variables explaining the type of employment contracts such as shares of temporary and pat-time contacts. Finally, in the fourth specification are added variables concerning the characteristics of companies such as: type of ownership and size.

Table 1.Estimation results (Labour productivity based on gross output)

Variable	1	2	3	4
Constant	-3.514385** (0.015)	-2.966279* (0.095)	-2.50289 (0.142)	-2.715164 (0.108)
lnK_{it}	.1491926*** (0.000)	.1584171*** (0.000)	.1598654*** (0.000)	.1526122*** (0.000)
lnW_{it}	.4121958*** (0.004)	.3611058** (0.045)	.3102328* (0.073)	.3078693* (0.071)
$Higher_{it}$		.256007 (0.402)	.149186 (0.615)	.1360976 (0.641)
$Young_{it}$		-.6941478** (0.014)	-.865934*** (0.002)	-.9095157*** (0.001)
$Female_{it}$		.0329658 (0.912)	.1385222 (0.634)	-.0061293 (0.983)
$Temp_{it}$			.570326*** (0.003)	.5581857*** (0.003)
$Part_{it}$			-.0497593 (0.879)	-.1014465 (0.754)
$Private_{it}$				.3712828** (0.040)
$Small_{it}$				.0648657 (0.704)
R^2 within	0.3202	0.3698	0.4362	0.4653
R^2 between	0.5987	0.4477	0.4795	0.6743
R^2 overall	0.5883	0.4446	0.4738	0.6581

Note: p-values are in parentheses; */**/*** indicate significance at 10/5/1 percent level respectively.

From Table 1 we can conclude that the estimated model is robust and provides results that are consistent with the theoretical assumptions. Namely, the capital intensity is the most important and statistically significant factor that determines the labour productivity. In addition, the average net wage positively affect the labour productivity. As expected, industries with higher shares of youth workforce have lower levels of labour productivity due to lower experience of younger workers. In contrast, higher shares of temporary jobs are associated with higher labour productivity assuming that temporary contracts are more characteristic for highly qualified professionals. Finally, according to the labour productivity based on gross output, higher share of private companies in a given industry is associated with higher labour productivity. The overall coefficient of determination in 0.66 which means that almost two thirds of the variability in the labour productivity at industry level can be explained by using the above specified model.

In addition, we estimate the model of labour productivity based on value added. The estimation results are presented in Table 2.

Table 2. Estimation results (Labour productivity based on value added)

Variable	1	2	3	4
Constant	-6.30454***	-4.248381**	-3.521617*	-3.665178*
	(0.000)	(0.039)	(0.061)	(0.054)
lnK_{it}	.2164551***	.2314028***	.2340926***	.2290128***
	(0.000)	(0.000)	(0.000)	(0.000)
lnW_{it}	.6334906***	.4287921**	.3487073*	.3448459*
	(0.000)	(0.039)	(0.067)	(0.071)
$Higher_{it}$		.6454233*	.4922129	.4892461
		(0.069)	(0.133)	(0.138)
$Young_{it}$		-.6416342**	-.8881359***	-.9109969***
		(0.047)	(0.004)	(0.004)
$Female_{it}$		-.2097224	-.0596226	-.1243156
		(0.544)	(0.852)	(0.708)
$Temp_{it}$			.8688714***	.8742803***
			(0.000)	(0.000)
$Part_{it}$			.0340863	-.0001452
			(0.924)	(1.000)
$Private_{it}$				.1866768
				(0.353)
$Small_{it}$				.1012489
				(0.597)
R^2 within	0.4366	0.4775	0.4362	0.5819
R^2 between	0.8319	0.7181	0.4795	0.7562
R^2 overall	0.8161	0.7097	0.4738	0.7449

*Note: p-values are in parentheses; */**/*** indicate significance at 10/5/1 percent level respectively.*

From Table 2 we can notice that the estimated coefficients are with approximately same magnitudes and signs as in the previously estimated model. In addition, the same variables except the variable *Private* appear as statistically significant, which confirms the robustness of the specified model.

5. CONCLUSIONS AND POLICY IMPLICATIONS

The Republic of North Macedonia generally experiences low aggregate labour productivity compared to more economically developed countries. However, several industries make exception and are characterised with higher levels of labour productivity. Those are: Electricity, gas, steam and air conditioning supply; Mining and quarrying; Financial and insurance activities; and, Information and communication. In addition, the empirical findings show that the higher levels of capital intensity, higher wage levels, good job experience and task-based contracts

characteristic for the 'gig economy' are the most relevant factors that influence the labour productivity at industry level.

The aggregate labour productivity in the Republic of North Macedonia still lags behind the developed OECD countries. On the other hand, although more volatile, the labour productivity in the ICT industry is considerably higher with signs for further improvement compared to the aggregate labour productivity. By taking into account the results from the previous empirical analysis, we can conclude that high capital intensity, high wage level and predominantly task-based contracts make ICT among the leading industries with respect to the labour productivity.

Regarding the role of ICT in the labour productivity of other sectors, according to the State statistical office in 2018, 94.4% of the enterprises used computer in their work, while 81.5% of the establishments with 10 or more employees had the fixed broadband connection to the Internet. From the total number of the enterprises, 53.9% had website/homepage, of which 89.6% provided on their website descriptions of goods or services, price lists, 51.7% had links or references to their social media profiles, and 21% provided online ordering, reservation or booking. Regarding the usage of e-commerce, 5.7% of the enterprises received e-sales orders via computer network, and 4.4% of the enterprises received orders for products or services via web-sales.

Having in mind the results from the empirical analysis, the policies aiming to improve labour productivity in North Macedonia should be focused on: Investment in physical capital, quality of education and training; and technological progress. In this context, investment in high tech information and communication technology appears as valuable strategy for improving the workforce labour productivity. However, the general impression is that the North Macedonia government is preoccupied with other priorities and is paying little attention to developing of the ICT sector. Up to the present, the sector has received very little support from the government that has led many companies to call for more recognition from the authorities.

The on-going government measures toward fostering ICT growth address two major challenges: innovation and human capital. The first challenge is addressed by the innovative fund, tech parks and incubators and the second challenge is mainly addressed by projects which set out to retrain human resources. Furthermore, there is a need of preparing a national framework for coordination between state institutions, the education system and the private sector, where growth opportunities would be strategically evaluated and acted upon. According to a country report prepared by the European Commission, there is a need for developing a long-term digital strategy. Namely, there is a number of barriers for further development of the ICT sector that have to be removed. In addition the policy makers on the long-term

need to create much more awareness about the professional opportunities that the ICT sector provides for young professionals and their future[3].

Although direct measures for ICT have not yet been implemented by the institutions, still the industry is rapidly growing. One very important issue that can be improved is stronger cooperation between the government and the ICT sector for introducing new taxes and regulations. For example, measures to introduce tax relief on exported services would make Macedonian ICT companies more competitive in the global market. By recognising the importance of information and communication technology for the entire economy, can lead to a true digital evolution in the country and faster economic development.

However, still needs a lot to be done to bring the country to the same level as more developed countries in the emerging Europe region. Many large ICT companies, such as Microsoft, Cisco, Oracle, Dell, IBM and Apple, are present in the Republic of North Macedonia via branch offices, distributors, dealers, resellers, solution providers, and business partners. But with an unemployment rate of 17.8 per cent, finding the right talent can be a tough challenge. There is quite a lot of demand for such services on a global level, and the real opportunity for the ICT sector is to match the demand with skilled professionals. In this context, the policy makers need to encourage cooperation between companies and universities by supporting partnership projects for the re-qualification of workers with IT-related skill profiles.

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[3] Source: https://emerging-europe.com

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APPENDIX 1

NACE Rev.2 Statistical Classification of Economic Activities

A	Agriculture
B	Mining and quarrying
C	Manufacturing
D	Electricity, gas, steam and air conditioning supply
E	Water supply; sewerage; waste management and remediation activities
F	Construction
G	Wholesale and retail trade; repair of motor vehicles and motorcycles
H	Transporting and storage
I	Accommodation and food service activities
J	Information and communication
K	Financial and insurance activities
L	Real estate activities
M	Professional, scientific and technical activities
N	Administrative and support service activities
O	Public administration and defence; compulsory social security
P	Education
Q	Human health and social work activities
R	Art, entertainment and recreation
S	Other services activities
T	Activities of households as employers
U	Activities of extra-territorial organisations and bodies

LABOUR PRODUCTIVITY IN TERMS OF THE FOURTH INDUSTRIAL REVOLUTION

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ABSTRACT

Recently, many studies and analysis confirmed that the world is at the beginning of a powerful process of transformation that will radically change our lives, ways of working and communicating.The Fourth Industrial Revolution is expected to improve the computerization of manufacturing industry and focuses on equipping the production with high technology. Three main goals of Industry 4.0 could be highlighted as: (1) Reduction of the human factor in manufacturing thus eliminating human errors. (2) Achieving high level of manufacturing flexibility and creating conditions for designing products that meet the specific requirements of the consumer. (3) Intensification of the production process.This paper aims to present the main trends in this field, to explain the benefits of technology and digitization for the global economy as well as to elaborate the importance of preparing different segments of society for effects from the Fourth Industrial Revolution onto the global labour market. This study obtains a panel data of six countries (France, Germany, Italy, Spain, UK and USA) for period between 1985 to 2017. The results have shown that information and communications technology and multifactor productivity are variables who have significant and positive impact on labour productivity while the variable average hours worked per person employed has a negative impact. Additional analysis of the demographic and socio-economic trends shows that the labour market will experience radical changes in the future.

Keywords:Fourth Industrial Revolution, Labour market, ICT, MFP

1. INTRODUCTION

A series of industrial revolutions took place after the 18th century. This process began by transforming the muscle into mechanical power that lead to an increase in human production through the cognitive power caused by the Fourth Industrial Revolution today.

The First Industrial Revolution lasted from 1760 until 1840 was led by the mechanical production through the construction of railroads and steam engines. Serial production supported by electricity and the assembly line in the late 19th and early 20th century started the Second Industrial Revolution. Third Industrial Revolution began in the 1960s and it was characterized as computer or digital

revolution which was developed through semiconductors, computer networks and the Internet.

Fourth Industrial Revolution, according to Klaus Schwab, was different from the previous revolutions in three aspects: speed, width and depth and the system effect. It took 120 years for the spindle that was the symbol of the First Industrial Revolution to spread outside Europe, while the Internet, in period less than 10 years, manage to spread throughout the whole world. There are still 1,3 billion people who do not have access to electricity, or only 17% of people are fully experiencing the Second Industrial Revolution. The same applies for the Third Industrial Revolution; half of the world population, mostly the developing countries, do not have internet access (Schwab & Davis, 2018). The Fourth Industrial Revolution is not connected only with smart machines and systems, it has a larger range. There are simultaneous leaps in various areas; from sequencing of entire genomes, nanotechnology, renewable energies to quantum techniques. The basic difference of this revolution from the previous three would be the possibility of merging of these technologies and their interaction in the physical, digital and biological areas.

The scope and the width of the technological revolution that is in the process of development will cause economic, social and cultural changes with incredible proportions; that is, according to the founder of the World Economic Forum, Klaus Schwab: "The changes are so profound that from the perspective of human history there has never been a time of greater hope, or greater danger". The Fourth Industrial Revolution will have wide and different impacts on the economy, and it will be very difficult to distinguish one effect from another. That is, most of the macroeconomic variables -GDP, investments, consumption, employment, trade, inflation, etc.- will be affected by the technological revolution". Yet, the focus of this paper is discovering and quantifying the potential effects of information and communications technology (ICT) investments and total factor productivity (or multifactor productivity - MFP) on growth (in terms of productivity as its own determinant in the long run) and the employment.

It is necessary to observe the potential effects of the Fourth Industrial Revolution along with recent economic trends and other factors contributing to growth. A few years before the Great Recession began, the global economy grew at rates of 5%, and if that growth has continued it would have taken 14-15 years for the global GDP to double and millions of people to be saved from poverty. The expectations that after the Great Recession the global economy would return to the previous path of strong growth have not been fulfilled. The global economy appears to be stuck with growth of 3-3,5% which is lower than the average post-war growth rate (Schwab, 2016).

Economists Larry Summers and Nobel laureate Paul Krugman have returned to the claim of several economists, especially Alvin Hansen's statement during the Great Depression about "the decline of the century" and "constant stagnation." The "constant stagnation" describes an unsurpassed situation in which although the

interest rates are close to zero, the steady decline on the demand side continues. If proven, the assumption assumes even greater declines in global GDP growth. If we imagine a final situation in which global GDP growth drops to 2%, doubling of the global GDP will take 34 years (Schwab, 2016).

There are several reasons for the slowing of the global economy growth (wrong distribution of the income, indebtedness, demographic changes etc.). For the research of this paper it is crucial to see the changes in the labour productivity that are connected with the investments in ICT.

The labour productivity has stagnated in the last 10 years despite the achieved exponential growth of the new ICT and investments in the innovations. According to the report "The Conference Board Productivity Brief" of the research company "The Conference Board", on a global scale, compared with the growth of the output per employee in 2017 for 2%, in 2018 it has grown for 1,9% and it is projected to be returned on 2% growth in 2019. The latest assesment continues the downward trend in global labour productivity from an average annual growth rate of 2,9% in 2000-2007 to 2,3% in 2010-2017. Also, the results of the analysis of the global labour productivity made from the same research company, confirm that effects of the productivity from the the long-awaited digital transformation are still too small to achieve permanent impact on macroeconomic level (The Conference Board, 2019). According to the data of the Bureau of Labor Statistics, the labour productivity has increased in the period from 1947-1983 for 2,8%, from 2000-2007 for 2,7% and in 2007-2018 for 1,3%.

The largest part of this decline is connected with the total factor productivity which is largely used as indicator of the income of the productivity connected with the technology and innovations. The Nobel Prize winner Robert Solow explains the long-run economic growth by looking at the capital accumulation, population growth and increases in productivity or technological progress. Later, Edward Denison splits the technological progress on its components and proves that education and technological progress in narrow sense are the most important factors for economic growth (Fiti, 2010). On a global scale, the growth of total factor production, which takes into account capital investment and workforce skills and thus provides a better picture of the overall efficiency of the manufacturing process that combines capital, labour and technological progress, has declined by -0,1% in 2018, while in 2017 it increased slightly by 0,2%. The stagnation of the total factor production from theprevious decade that continues in 2018 is a matter of concern, especially when it comes to the medium-term outlook of the growth. This means that modest productivity growth is still the result of the accumulation of physical capital rather than the benefits of expanded efficiency or innovation (The Conference Board, 2019).

The purpose of this paper is to examine the effects of the annual changes in the investments in ICT, MFP and the average hours worked per person employed on the annual changes in the labour productivity by taking an example from the six countries (France, Germany, Italy, Spain, Great Britain and USA) in the period from 1985-2017. Given the reviewed literature, we hypothesize the positive impact

of investment in ICT, MFP and the negative impact of average hours worked per person employed on the labour productivity.

The paper is structured as following: after the introduction we have consulted the relevant theoretical and empirical literature where the theoretical background of the relation between the labour productivity growth and investments in ICT and other macroeconomic variables is explained,and papers that apply a variety of different macroeconomic variables and methodologies to US economy and more developed EU countries are also consulted. We continue with our analyses using the panel regression method to examine the impact of ICT investments, changes in MFP and average hours worked per person employed on labour productivity growth. Finally, we draw some conclusions about the process of the Fourth Industrial Revolution and the investments in new technologies that affect labour productivity in developed economies.

2. LITERATURE REVIEW

Technologies have undoubtedly contributed to improvement of the living standard and prosperity globally. They also continue to generate numerous negative impacts. More digital platforms are contributing for the wealth accumulation in the hands of a smaller group of people, and this is causing the workers to feel more insecure and vulnerable; techniques used in natural gas extraction continue to damage the environment and by transferring costs to marginalized affected parties the owners are becoming even richer. According to Hicks and Devaraj (2015), in the United States since 1990, approximately 83% of manufacturing job are lost are due to capital investments in equipment, and long-term changes in manufacturing sector employment are most linked to US factory productivity.

Most of these externalities have evolved gradually over the last 30 years, but as the Fourth Industrial Revolution progresses and changes occur much more rapidly, we will be faced with even more diverse, more complex and destructive effects of the new technologies. Well-known economists Brynjolfsson and McAfee (2014), have popularized the emergence of a "big separation" of the labour and the technology-driven productivity. Keeley (2015), blames technology as responsible for increased inequality because 80% of the reduced labour force contribution to national income creation in OECD countries is attributed to technological development and the public's perception that policies favor economic growth is increasingly reinforced before social cohesion and human well-being.

The slowing of the productivity between the matured economies in the last decade was dramatic, that is, the output rates by hour were halved from the average annual growth rate from 2,3% from 2000-2007 on 1,2% in the period from 2010-2017. The productivity growth rate has further decreased on 0,8% in 2008 with chances for improvement of 1,1% in 2019. Given the longer-term outlook, the decline in productivity growth rates in mature economies seems to have reached the bottom in the recent years.However, after a significant improvement in MFP growth

in 2017, mature economies in 2018 returned to levels below the average growth rate in 2010-2017 (The Conference Board, 2019). Van Ark, et al. (2003), in their paper highlighted the main reasons for lower productivity growth in Europe in the 90's than in the United States. The results indicated that that the productivity in USA increased faster than in the EU because in the United States, besides producing ICT, these technologies were used more successfully in other industries, while the EU was lagging behind in that respect. Most European economies showed significantly lower levels of investments in ICT goods and software than the United States. As mentioned above as USA's productivity growth accelerated, the EU has been slowing down since the mid-1990s. It also contradicts the fact that MFP in the US declined slightly faster in the USA than the average of other mature economies, pointing to the greater importance of the efficiency and innovation investments during this period.

H. Hall and Sena (2017), discuss about the lower concentration of research and development in Europe, they focus on discussing the changes in the industrial sector and stated the small ICT production sector as the main reason. There is a similar interest in policies for the implementation of different variants of investment in the structure of the workforce skills. Given the results of significant previous research, it becomes clear that investments in ICT are often accompanied with undertaken innovations and in cooperation with other non-ICT investments.

Akande, et al. (2017), examined the impact of ICT investment on labour productivity in 19 OECD countries. Despite the different social and economic structures, all 19 countries showed a positive impact of ICT investment on productivity. The variables, the share of total labour compensation in GDP and the strength of trade unions showed a positive but insignificant impact on productivity. On the other hand, the variable of the average annual working hours per one employee is shown to have a negative impact on labour productivity. Dimelis and Papaioannou (2011), analyzed 42 countries and provided solid evidence of a significant impact of ICT on reducing inefficiencies in the country and on increasing of the labour productivity.

Considering the previous studies and the particular importance of this issue, our paper conducted a panel regression to analyze the impacts of ICT investments, MFP growth, and average hours worked per person employed on labour productivity growth of the six developed countries for which high-quality time series are available. Starting from 1980, with the globalization of the economy, production began to shift towards countries offering low wages and tax convenience. The transfer of capital from USA and Europe to China and other Far Eastern countries was in question. With time, these countries started production under their brands, let alone produce for others. As a result, China caused a huge boom in industrial products sales of 241% from 2006 to 2011. When Western countries became more aware of this situation and in order not to widen the gap between East and West even more, Industry 4.0 brought it to the agenda and the "reshoring" trend started to gain popularity. Given that the initial effects of the Fourth Industrial Revolution will be realized in these countries where it started, in

our model we have included those countries to have an idea of how the process will further expand and what effects it will have on emerging markets and other developing countries. Also, we wanted to conclude whether the trend of "returning the production and manufacturing of goods back to the domestic country" would revive labour productivity and multifactor productivity or not. As we have seen above, there is a significant decline in labour productivity and ICT investments in OECD countries, and therefore there is a need to investigate the relationship between the macroeconomic variables. Existing empirical literature extensively discusses the reasons why a certain percentage of output growth was not explained by inputs, while little attention has been paid to the paradox of labour productivity. Abramovitz (1956), and Solow (1957), argue that more than 40% of outputs was not explained by inputs which is contrary to the mainstream economics. They rather found ICT as a source of innovative capabilities and knowledge as competitive driver explaining the paradox. We believe that this study will be very useful and a basis for future research.

3. DATA, METHODOLOGY AND ANALYSIS

In order to analyze the factors that have effect on the labour productivity panel regression model is used in this research. Data are collected for six countries (France, Germany, Italy, Spain, UK and USA) for period 1985-2017 (thirty three periods) and total number of 198 observations. Data were collected from OECD Productivity Statistics. The dependent variable, Labour productivity (LP) is measured as measured as growth in GDP per hour worked, (annual change in %), and the explanatory variables used in the model are: Information and communication technologies capital (annual change in %) (ICTC), Average hours worked per person employed (annual change in %) (AHW) and multifactor productivity (annual change in %) (MFP).Variables explained in OECD database:

- LP - Labour productivity growth is a key dimension of economic performance and an essential driver of changes in living standards. Growth in gross domestic product (GDP) per capita can be broken down into growth in labour productivity, measured as growth in GDP per hour worked, and changes in the extent of labour utilization, measured as changes in hours worked per capita. High labour productivity growth can reflect greater use of capital, and/or a decrease in the employment of low-productivity workers, or general efficiency gains and innovation.

- ICTC - Estimates of ICT capital services in the OECD Productivity Database can be broken down into three types of assets: computer hardware, telecommunications equipment and computer software and databases. Countries use different approaches to deflate ICT investment series; where constant quality price changes are particularly important but difficult to measure. To ensure comparability of ICT capital services across countries, the OECD capital services measures are

based on a common computation method for all countries and a set of harmonized ICT investment deflators.

• AHW - Average hours worked per person employed - For productivity analysis, the underlying concept for labour input is total hours worked by all persons engaged in production. These reflect regular hours worked by full-time and part-time workers, paid and unpaid overtime, hours worked in additional jobs, and time not worked because of public holidays, annual paid leave, strikes and labour disputes and other reasons.

• MFP - Growth in multifactor productivity (MFP) is measured as a residual, i.e. that part of GDP growth that cannot be explained by growth in labour and capital inputs. Traditionally, MFP growth is seen as capturing technological progress but, in practice, this interpretation needs some caution. First, some part of technological change is embodied in capital input, e.g. improvements in design and quality between two vintages of the same capital asset, and so its effects on GDP growth are attributed to the respective factor. MFP only picks up disembodied technical change, e.g. network effects or spillovers from production factors, the effects of better management practices, brand names, organizational change and general knowledge. Second, data and resource constraints hamper a precise measurement of labour and capital input, affecting MFP. Moreover, MFP also captures other factors such as adjustment costs, economies of scale and effects from imperfect competition.

All included variables are tested with panel unit root test in order to confirm or deny their stationarity. The results are presented in Table 1.

The panel unit root tests are composed of: Levin, Lin and Chu test where the null hypothesis states that there is common unit root process in the panel variable and Im, Pesaran and Shin W-stat, ADF-Fisher Chi square and PP-Fisher Chi-square where the null hypothesis is formulated as existence of individual unit root process. The tests are performed with specification of individual intercept. As is evident of from the presented results, variables are stationary in their level, where for LP, AHW and MFP the null hypothesis for presence of unit root is rejected at 0.01, while for variable ICTS it is rejected at 0,1 and 0,05 for different tests.

Table 1. Panel unit root tests

Variable	p-values			
	Levin, Lin and Chu t*	Im, Pesaran and Shin W-stat	ADF-Fisher Chi-square	PP-Fisher Chi-square
Level				
LP	***0,0000	***0,0001	***0,0007	***0,0000
ICTC	**0,0133	**0,0416	*0,0909	0,2107

AHW	**0,0000	***0,0001	***0,0000	***0,0000
MFP	***0,0000	***0,0001	***0,0000	***0,0000
First difference				
LP	***0,0000	***0,0001	***0,0000	***0,0000
ICTC	***0,0000	***0,0001	***0,0000	***0,0000
AHW	***0,0000	***0,0001	***0,0000	***0,0000
MFP	***0,0000	***0,0001	***0,0000	***0,0000

*Null hypothesis is rejected at 0,1; **Null hypothesis is rejected at 0,05; ***Null hypothesis is rejected at 0,01; Source: Authors calculations.*

Before the model was estimated, Hausman for Endogeneity or Hausman Specification Test was performed which in panel data regression is used to specify if the fixed effects model or random effects model is supposed to be used. The null hypothesis appoints for random effects model, while the alternative hypothesis specifies that fixed effects model is to be used. The results of the Hausman test in this analysis indicate Chi-Square Statistic of 5,171 with p-value of 0,1597, indicating that the null hypothesis is accepted and model with random effects is used.

The random effects approach proposes different intercept terms for each entity and again these intercepts are constant over time, with the relationships between the explanatory and explained variables assumed to be the same both cross-sectionally and temporally. The difference is that under the random effects model, the intercepts for each cross-sectional unit are assumed to arise from a common intercept α (which is the same for all cross-sectional units and over time), plus a random variable ϵ_i that varies cross-sectionally but is constant over time. Variable ϵ_i measures the random deviation of each entity's intercept term from the 'global' intercept term α. Random effects panel model is presented in the following equation:

$$y_{it} = \alpha + \beta x_{it} + \omega_{it}, \omega_{it} = \epsilon_i + \upsilon_{it}$$

where x_{it} is $1 \times k$ vector of explanatory variables, but unlike the fixed effects model, there are no dummy variables to capture the heterogeneity (variation) in the cross-sectional dimension. Instead, this occurs via the ϵ_i terms. Note that this framework requires the assumptions that the new cross-sectional error term, ϵ_i, has zero mean, is independent of the individual observation error term ($\upsilon_1 it$), has constant variance σ_ϵ^2 and is independent of the explanatory variables x_{it} (Brooks, 2014).

Panel regression model with random effects for the analyzed data is given in the following equation:

$$LP_{it} = \alpha + \beta_1 ICTCS_{it} + \beta_2 AHW_{it} + \beta_3 MFP_{it} + [(\mu]_i + \epsilon_{it})$$

where the LP_{it} is the dependent variable, $ICTCS_{it}$, AHW_{it} and MFP_{it} are explanatory variables, μ_i is the unobserved random effect that varies across countries but not over time, and ϵ_{it} is an individual (idiosyncratic) error term, $i = 1, ..., N$; $t = 1, ..., T_i$.

Results of the random effects panel estimation are presented in table 2.

The coefficient of determination R^2 has a value of 88,71%, which indicates that many of the variations in the model are explained by the included variables. The p-value of the F-statistics of the evaluated model is lower than 5%, and we accept the hypothesis that the explanatory variables have a significant impact on the movement of the dependendt variable. Multicolinearity has been tested through the variance-inflation factor (VIF). In order to examine the multicollinearity, we present the ICTC as a function of other independent variables. The VIF score of that model is lower than 5; and it is generally accepted that if VIF is greater than 5 then multicollinearity should be treated as a problem. A Jarque-Bera test has also been performed to test whether random errors follow a normal distribution. The p-value of the test statistics has a higher value of 5%; in this case we cannot reject the null hypothesis that the residuals follow a normal distribution.

Table 2. Results of the random effects panel regression

Explanatory variables	Coefficient	t-statistic	Probability
ICTC	0,018085	3,013983	***0,0029
AHW	-0,323684	-8,490199	***0,0000
MP	0,998269	35,50252	***0,0000
α	0,409395	5,411892	***0,0000
R^2	0,887129		

Effects specification		
	SD	Rho
Cross-section random μ_i	0,046894	0,0125
Idiosyncratic random ϵ_{it}	0,416330	0,9875

Source: Authors calculations.

The findings prove that all three explanatory variable have statistically significant effect on the labour productivity. Information and communication technologies capital has a significant and positive impact onto the productivity (the p-value of t-statistic is 0,29%). Increasing ICTC per 1% increases labour productivity by 0,02% ($\beta_1 = 0,018085$), and similar effect is found with multifactor productivity (the p-value of t-statistic is 0%). Increasing MP per 1% increases labour productivity by 0,998 ($\beta_3 = 0,998269$). Average hours worked per person employed has negative coefficient with accounts for inverse relationship with the labour productivity (the p-value of t-statistic is 0%). Increasing AHW per 1% decreases labour productivity by 0,32 ($\beta_2 = -0,323684$).

The Solow-Swan model argued that an increase in capital accumulation and labour force will increase the economic growth rate, but only temporarily because of diminishing returns and once the steady-state is reached and the resources in a country are used up, the economic growth can only be increased through innovation and improvements in technology. We also tried to measure the impact of the change in total factor productivity on labour productivity growth. The rise of MFP is often attributed entirely to technological progress, but it also includes any permanent improvement in the efficiency with which factors od production are combined over time. The Solow residual is the unexplained change in output growth after calculating the effect od capital accumulation. Productivity paradox referred to a decline in the productivity growth in the United States in the 1970s and 80s despite the huge investments and rapid development in the Information Technology (Akande, et al., 2017).

We found that the growth of average hours worked per person employed has a negative impact on productivity growth. The law of diminishing returns expresses a very basic relation. As more of an input such as labour is added to a fixed amount of land, machinery, and other inputs, the labour has less and less of the other factors to work with. The land gets more crowded, the machinery is overworked, and the marginal product of labour declines.

4. CONCLUSION

According to the results of the analysis, the paper investigates the effects of ICT investments and their annual changes on the impact of labour productivity growth in six developed countries (France, Germany, Italy, Spain, UK, and the USA) in the period 1985-2017. Despite the different social and economic structures, all six countries show a positive response to labour productivity growth driven by investment in ICT.

The theoretical background of the problem and the empirical literature consulted have made the hypotheses presented obviously. The series of hypotheses we have outlined at the beginning of the paper are in the area of acceptance. All three explanatory variables have a significant impact on labour productivity growth. Investments in ICT as a target variable in our analysis show a positive impact on labour productivity growth. The growth of MFP, which is an indicator of the residual, that is, the share of GDP growth that cannot be explained by the growth of labour and capital inputs, also shows similar effects on labour productivity growth.On the other hand, the growth of the average hours worked per person employed show negative impacts on the growth of labour productivity. In conclusion, we can say that the model is relevant to the hypotheses presented earlier, showing that ICT investments affect labour productivity at a significant level with a strong positive impact.

This study, as we have already highlighted, presents the effects that ICT investments have on labour productivity growth at the level of national economies.

They can be used by policymakers to assess potential labour productivity growth taking into account investments in ICT or other technological change, network effects and overflow effects of other factors of production, effects of better managerial skills, organizational changes, etc. Identified trends in labour productivity growth can be helpful in the process of selecting and favoring certain technological or organizational changes in individual sectors. Labour productivity has an impact on socio-economic development not only at the national level but also at the organizational and individual levels. Improvements in labour productivity nationally support economic growth, international competitiveness, GDP, and as a result stimulate educational, social and environmental programs.

Also it is important to reflect upon what this might mean for developing countries. One challenging scenario for developing countries is if the Fourth Industrial Revolution leads to significant "reshoring" of global production and manufacturing to advanced economies, something very possible if access to low-cost labour no longer drives the competitiveness of firms. The ability to develop strong manufacturing sectors serving the global economy based on cost advantages is a well-worn development pathway, allowing countries to accumulate capital and transfer technologies, because one of the biggest challenge in the developing countries is the insufficient capital accumulation that should provide the necessary for economic growth. Republic of North Macedonia, who was late to integrate with Europe and the global economy, has also embarked on a foreign direct investment-led journey to enhance exports and growth performance. If this pathway closes, many countries will have to rethink their models and strategies of industrialization. Our results suggest that ICT and other new technologies provided by Fourth Industrial Revolution and the new digital era has a strong positive impact on labour productivity and economic growth. We believe that in order to boost labour productivity and to increase economic growth in these countries such as North Macedonia, ICT investment should be stimulated by policies. Also, how developing countries can leverage the opportunities of the Fourth Industrial Revolution is a matter of profound importance to the world.

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APPENDIX

*Figure 1. Labour productivity, annual growth rate (%)*
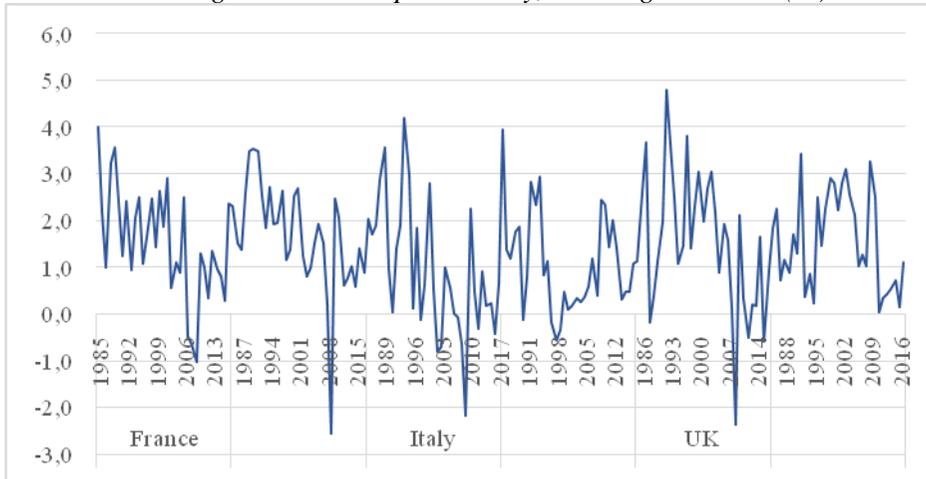
Source: OECD Productivity Statistics.

Figure 2. ICT capital, annual growth/change (%)
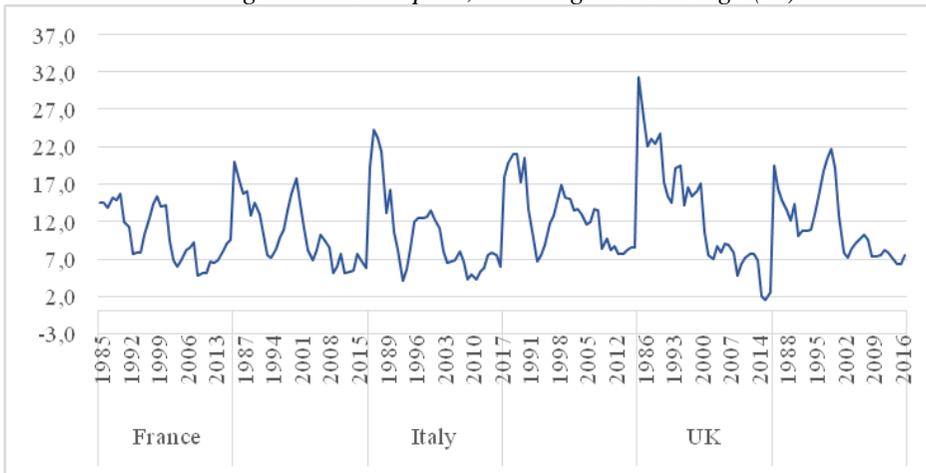
Source: OECD Productivity Statistics.

Figure 3. Average hours worked per person employed, annual growth/change (%)
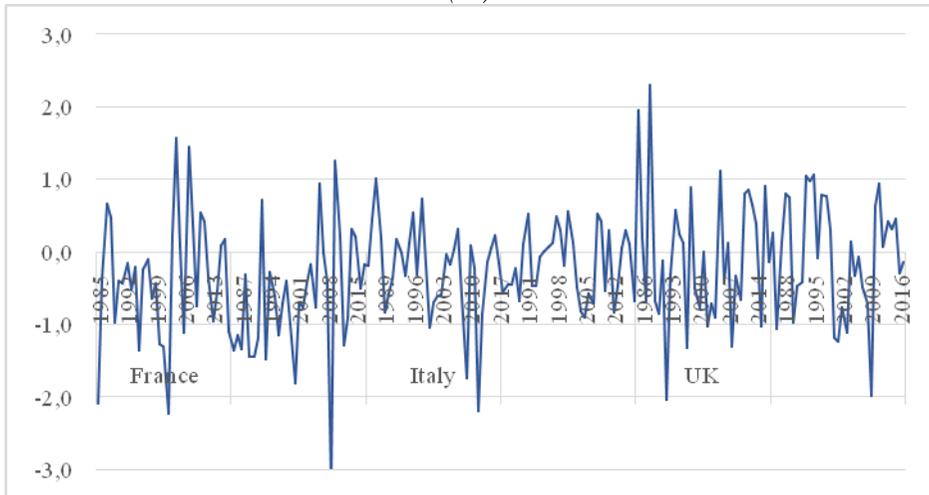
Source: OECD Productivity Statistics.

Figure 4. Multifactor productivity, annual growth/change (%)
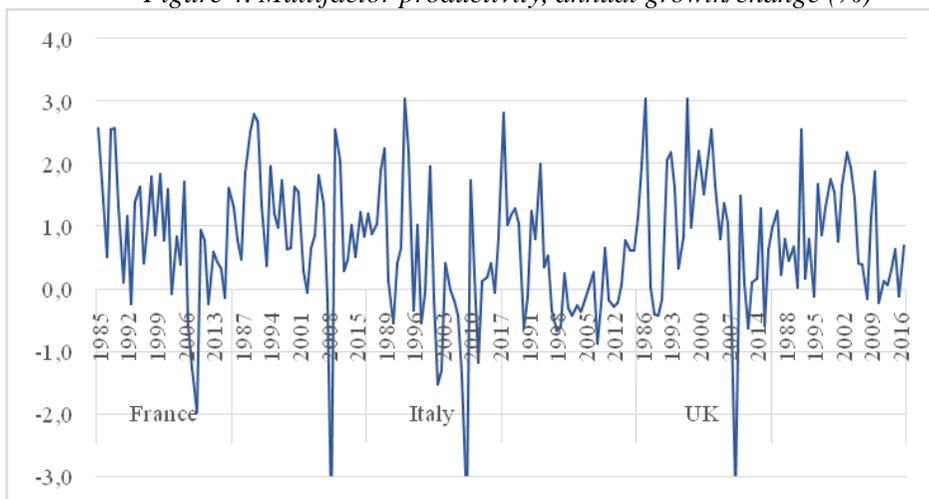
Source: OECD Productivity Statistics.

TOWARDS ORGANIZATIONAL COMPLEXITY OF THE EUROPEAN HIGH-LEVEL POLICY IMPLEMENTATION

Renata Petrevska-Nechkoska, Olivera Kostoska

ABSTRACT

The organisational complexity and adaptive, yet effectiveimplementation of high-level policies for socio-technical-environmental systems represent a challenge derived from the need to respond effectively to changes in dynamic and unpredictable environment, while aiming to achieve the set purpose(s). The broad stakeholder ecosystem as well as the high-level European (but also global) policies are interrelated, networkedand knowledge-driven, butas the recent pandemic shows, they also need to be effect- and impact-driven. It takes a lot of reconfiguration and situational awareness from different managerial and governing altitudes to be able to comprehend and facilitate dynamics and complexity of the systems, policies, projects and contexts. For a small number of institutions, businesses and projects, embracing complexity yields a competitive edge in terms of creativity, innovation, information management, and social advancement. However, even the most well thought of and globally aligned European high-level policies and strategy (as well as the most developed countries) need a paradigm shift in the 'how' of their implementation, as perceived from, what we take as position, the end-users of the effects of their implementation - the countries and the citizens. If we consider our countries, unions, departments, projects as complex adaptive systems, then we need to take into account their specificities to address and guide them properly. This position paper looks through the lens of system design, complex adaptive systems, and the tactical management adaptability and effectiveness to provide an analysis of the European (1) strengths in strategy and operations (2) problems in 'silos', matrix-organizations, insufficient information and communication flows, current project management and slow risk management (3) through an example of the freedom of movement for workers (4) 'business model', and (5) growth paradigm that need to be fundamentally redefined through the value co-creation and co-evolution. The solutions we provide here are both conceptual (e.g. greater effectiveness delivered through the existing governance structures by drawing attention to the missing link between tactics and empowered project management), and tangible (e.g. methods, such as the Denica method for tactical management, providing adaptability in dynamic and unpredictable environment that is preserved by continuous Sense-Interpret-Decide-Act (SIDA) Loop and Role-and-Accountability system design, with proper information sensors, emitters and risk management for strategy and tactics).

Keywords:complexity, Denica method, sense-and-respond framework, policy implementation.

1. INTRODUCTION

The planet, a state, the union, a department – they all represent complex adaptive systems. The latter (planet excluded) stand for the lower level sub-systems which, as autonomous agents, are networked together and interact towards achieving their own and collective purposes (Gell-Mann, 1992; Garcia, 1999; Holland, 2010; Lichtenstein et al., 2006; Chan, 2001; Gintis, 2006; Eidelson, 1997; McGrath, Arrow and Berdahl, 2000; Higgs, 1999). By definition, a complex adaptive system (CAS) is a dynamic network of agents acting in parallel and always reacting to the actions of other agents, which in turn affects both the behavior and the network as a whole (Holland, 1975). Until we acknowledge that our societies, planet and many of its sub-systems are complex adaptive systems needed to be addressed properly, we will never punctuate the equilibrium (Gersick, 2009) that requires change to move to the next level. Complex adaptive systems are open, dynamic, self-organizing and non-deterministic systems having highly interactive elements and non-linear interactions, with small changes producing large effects. What's more, every single element of the system is affected by and also affects the other systems (Holland, 2010) which cause an emergent effect (Edson, 2010). The question that naturally arises is whether we take into account these scientific and practical findings when doing something that might affect them? How do we manage a particular complex adaptive system to accomplish certain goal(s)? What is recommended for complexity is that we have to: 1) address it with both simple rules and human rules on how to detect and interpret information, as well as how to respond appropriately 2) create moderately dense connections (Waldrop, 2013).

It appears that we (as global citizens, as national governments, as Europe, as EU, and as a World) are rather good in making strategies and, to a certain extent, we are doing a good job in realizing those strategies. If they were all to be implemented in perfect conditions and non-dynamic, non-interrelated world, we would have been almost perfect. There are numerous examples of proper strategy setting, e.g. Millennium Development Goals (United Nations, 2000), post-2015 ambitious Sustainable Development Goals (United Nations, 2015a), Paris climate agreement (United Nations, 2015b), EU global strategy (European Union – Institute for Security Studies, 2015), Strategy for smart, sustainable and inclusive growth (European Commission, 2010), etc. Their strategic altitude (Strategy Management Group, 2016) follow-up occurs in the form of reports, findings or recommendations (United Nations, 2015c; European Commission, 2015a; European Commission, 2015b). There are also numerous EU institutions and bodies (European Commission, 2016a), as well as many acts, regulations, directives, and processes (European Commission, 2016b) in place. The pandemic of 2020 notes positive examples of initiatives and projects on global, yet pan-European level, such as the EUvsVirus phenomenon. A number of guidelines and governing principles exist in the form of founding principles (European Union, 2019) or freedoms (European Policy Centre, 2019) prescribed in various strategic documents and actions. All of the above-mentioned entails the need to differentiate between strategy and operations. Adding onto the side of operations, there is extensive portion of

accomplishments resulting in high quality and incredible intellectual real-life practical efforts and creations. However, these strategic guidelines, principles, goals and KPIs need to be implemented, monitored and sustained towards effectiveness, whilst at the same time the operations are doing their part of the work – quality and efficiency. The intention of this position paper is actually to examine how we could steer more effectively a complex adaptive system towardspurpose(s), goal(s)?! We will therefore throw light on tactical management (especially to adaptability, continuous context-scanning, responsiveness and dynamics) and, by looking at the freedom of movement for workers touching points with labour market aspects, provide a genuine, real-world example on the need for a system design, roles and accountabilities, 'silos' collaboration and process-flow design and initial recommendation on the 'how'. We are incorporating a brief reflection to the current pandemic as relevant verification of the suggested position here, generated few years ago, reaching even greater validity even at present times.

The rest of the paper is organized as follows. The second section refers to tactics and projects in terms of: helicopter authority and adaptability; information sensors; and risk management. The third section speaks of the system design and addressing. The fourth section provides an analysis of the freedom of movement for workers. The last section concludes and makes recommendations.

2. TACTICS AND PROJECTS: HELICOPTER AUTHORITY, ADAPTABILITY, INFORMATION SENSORS AND RISK MANAGEMENT

Tactical management (in the form of continuous institutional and organizational tactics) and the redefined project management (as one of tactic's most representative handlers) are of special importance. The tactical management we are referring to here is not what we call a 'mid-term planning' or regular follow-up that is exclusively too late for any corrective or timely action. On the contrary, the tactical management we are shedding light to refers to adaptability, continuous context-scanning, responsiveness and dynamics. Tactical management is a managerial function concerned with 'how to achieve what is expected by utilizing what is given and following certain governing principles in the current context of the organization and environment' (Petrevska Nechkoska, Poels and Manceski, 2015) (Petrevska Nechkoska, 2019). These are the residual choices open to a firm by virtue of the business model that it employs (Casadesus-Masanell and Ricart, 2010). Adaptability and context-capture are two essential components of this definition. Utilizing the givens and aiming for achieving expectations are another set. Employment of appropriate business model is an issue. And last but not least – 'how to achieve' the goals is the most important one. Regular planning and periodical evaluations are too late, simply concluding the discrepancies between planned (and actual) developments and KPIs. What every significant goal needs, is actually a dynamic adaptability framework for a socio-technical system that is responsive to leader's guidance and actions. Tactics of this type introduces the concepts of customer-back system design, level of 'roles' and 'accountabilities',

Sense-Interpret-Decide-Act (SIDA) Loop as adaptability engine connected with Plan-Do-Check-Act (PDCA) Loop as improvement engine (Haeckel, 1999; Crim, 2014; Nalchigar and Yu, 2013; Kapoor et al., 2005; Haeckel, 2004; Forno, 2012), each completed with information sensing, emitting and revisions, and continuous risk management (Petrevska Nechkoska, Poels, and Manceski, 2016). It's obvious that with this position we aim to shift the paradigm of thinking and acting. Moreover, we need to motivate ourselves to make sure that our efforts and deeds will not fail. Tactics 'are inexhaustible as Heaven and Earth, unending as the flow of rivers and streams; like the sun and the moon, they end but to begin a new; like the four seasons, they pass away to return once more' (Sun Tzu, Chinese philosopher, general and strategist). The intertwining of strategy, tactics, operations is still inseparable and necessary – yet, these 'islands' are drifting away from each other along with the expansion of the universe. Project management (that steers while maneuvering these three managerial functions) is a managerial activity that should promise effectiveness. Instead, project management, especially in terms of non-purely business domains, where the profit is not the primary motivation, is 'stuck' in the matrix-organizational structures and silos, complex procedures, duplicated and redundant administrative steps, with both inappropriate authority level and information, as well as risk awareness and responsiveness. Likewise, even when chasing profits, most of the projects are over budget, over time, with compromised functionalities, over and over again (Flyvbjerg, 2011).

3. SYSTEMS DESIGN AND ADDRESSING

After the important realms – complex adaptive systems, tactical and project management (reflected on strategy and operations) have been introduced, the next few paragraphs will provide a guideline on how we can assist and overcome them, in international strategies realized across global ecosystems of interrelated stakeholders. It takes time to digest and reason, and then implement adaptable tactical management mindset from the highest level down and across. Primarily, we ought to address a CAS with simple rules. If a person makes just one step from the strategic guidelines, he/she will face mastered complicatedness and ambiguity of written recommendations, rules, guidelines, expectations, documentation, process flows and sequences. However, the things get even worse if we try to address a complex adaptive system with complicated rules and unoptimized processes. In order to achieve big-picture overview and synergic effect, the governing bodies need to think in terms of system design, referring to socio-technical system that complies with the specificities of a complex adaptive system. A system is a collection of elements interacting to produce an effect that cannot be produced by any subset of those elements (Banathy, 1996, 2009). A properly designed system generates an effect, but also has a reason-for-being, no duplicated or redundant roles, sub-optimization, and control mechanism. Most systems have control mechanisms, waste management components, information sensors, networks of channels, and elements for proper reactions. A car does not have ten engines; a body

does not have two eyes for aesthetics, but to achieve three-dimensional vision; the planet does not have another planet to put the garbage on, but needs to establish/re-establish itself for properly containing it; an organism has immediate controls for temperature regulation, etc. We are spiralling into sub-optimization and developing sub-systems looking from the middle-down or even lower level down. It is recommended that the tactical management systems should be designed from a higher level as possible. Indeed, our strategic thinkers provide appropriate guidelines, goals, recommendations, and follow-ups, but looking below the surface, we find that things are blurry, segmented, duplicated, and ambiguous, with slow inter-communication and action channels in the network. Europe still has the prevalence of 'silos' and matrix-organisational structures – the 'nemesis' of effectiveness, adaptability and empowered project management. However, for many situations, we have no proper controls in place. This goes along with the risk management that, in our opinion, should not be a separate function, but rather integrated in every single manager's sense-making. It appears that governing bodies of developed countries are having the impression that any physical/legal person is decent and honest. Sometimes because of ignorance and un-familiarity, but many times as a result of ill-intentions, the world is populated with criminal entities and harmful actions, irrespective of whether the motivation is coming from the mind, body or soul. So, a good systems design has controls in place, and when it comes to socio-technical or natural systems, it also provides a 'knowing earlier' (Haeckel, 2004) in order to take corrective or proactive action. Another important element to position the risk management reasoning from the very beginning is the necessity of continuous scanning throughout the lifecycle and beyond (Petrevska Nechkoska, Poels and Manceski, 2016). Information sensors (what we need to know to achieve the purpose), information emitters (what we need to know but will not be obvious to us, for achieving our purpose), risks (what may go wrong and prevent achieving of purpose), roles, and accountabilities do not represent components to set-and-forget. On the contrary, they are dynamic and alive. The findings of a tactical management adaptability and information systems research with managers have shown that 87% of all information sensors and emitters contain qualitative information; 61% of incoming information is on-demand unstructured information, and only 39% of the information is provided through event-driven reports and regular 'too late' follow-ups; 48% change the frequency, while 13% change the manner of obtaining (Petrevska Nechkoska, Poels and Manceski, 2016). The important information is rather dynamic (not rigid and prescribed) and is coming in various forms, frequencies and modes of acquisition.

4. FREEDOM OF MOVEMENT FOR WORKERS: A CRITICAL APPRAISAL

If freedom of movement for workers is considered a developmental and altruistic principle that reflects to pro-growth immigration, labor-market flexibility, effective education, and that also contributes to innovation, competitiveness, digitalization and public sector productivity, the question that arises is what are the obstacles still in place preventing this principle from being alive to its full? An example using more extreme cases will be provided here to make a point of the necessity for a system design, roles and accountabilities, 'silos' collaboration and process-flow design, as well as (tactical) problems in its realization (even though well designed in strategy and nicely fulfilled through operations). To find a job in Europe and increase chances of success, a person needs to register a profile in recruiting platforms, e.g. EURES, ESRA, CORDIS, EURAXESS, ORCID, LinkedIn, Research Gate (if in research), Xing, Google Scholar, Biblio, e-Prints of all kinds, Elsevier etc. Each of these platforms (own research) require manual one-by-one record input of each experience, language, profile, education, skill, motivation, publication and continuous update. EURES draws categories of skills, competences, qualifications and occupations from ESCO (European Commission, 2013) – excellent idea, especially for the focus on skills that are the future of HR management (Petrevska Nechkoska and Manceski, 2012). Overarching and encompassing, with remarkable thoughtfulness and directions – New Skills Agenda for Europe (European Commission, 2016d) is in place and action points are designated. And then it all goes into silos and matrix sub-optimization, with almost no overlap and very little visible collaboration among the verticals – blurry and not very effective. The results are visible in projects and platforms with immense quality of realization, reports, science, conclusions, significant intellectual input and output. The problem is that many of them have been doing things 'in isolation', as if everything/everyone else does not exist or is static. The collaboration and mutual awareness of synergy and problems appear to be missing. Top EU management should set up a tactical system of roles and accountabilities that will be populated by various resources (e.g. departments, bodies, experts, countries, etc.) and will incorporate collaboration; making a mandatory requirement for 'silos' to work together towards its purpose. That tactical system should be designed from a high level, not as it is now. The same goes through funding for academy-business projects, multi-disciplinary projects, or business-ecology projects. Let us get back to the workforce mobility recruitment stage. ESCO is a nicely designed platform, but its intuitive use and part of the database content and connections are discussable. The attempt to find relatively straightforward occupations (e.g. researcher, manager, lecturer, teaching assistant, or consultant) at first seems impossible. At second attempt, there are either huge details making a person not in a position to situate himself/herself, or a several-step quest for a strange category producing confusion to classify a person not to be mistaken for deception in his/her CV. The main

purpose – the skills passport – to recognizeskills – is not functional up to this moment. There should have been information sensors in place, to catch very early signal for such an important function. The existence of several others similar-but-slightly-different platforms confirm lack of the system design and collaboration among members. This European Commission tactics seems like a model of disconnected and not-talking-to-each-other sub-systems aiming to their own goals.

Figure 1 visualizes a generic Role-and-Accountability system diagram based on Sense-and-Respond framework for adaptability (Haeckel, 1999) for tactical management designed around a purpose (strategic goal), with roles positioned throughout the widest business ecosystem (Petrevska Nechkoska, Poels and G. Manceski, 2016) and the use of Social Network Analysis directed graph. A person needs days to maintain his/her profiles in different platforms just to be visible on the job market. The discrepancies per countries' National Qualification Frameworks in the similarity of the European Qualifications Framework – EQF (European Commission, 2005, 2008) are still significant. Knowledge of local language, salary contributions recognition, local labor regulations and sometimes migration, housing or taxation rules and regulations are challenge on their own – and are mostly country-specific. The case of non-EU European countries is worth mentioning, with highly qualified workers moving to EU for positions of fast-food workers or drivers, up to level 4 in the EQF. In conclusion, the freedom of movement for workers is not facilitated yet. There are numerous efforts in this direction, e.g. EU Blue Card (European Commission, 2016c; 2016d); the aforementioned networks for connecting employers and job-seekers and other components. Some are duplicated and redundant, not designed from systems perspective, and thus not producing the expected effect. The knowledge triangle (European Institute of Innovation and Technology, 2012) should result into obligatory applicability of research and science in real-life (DG Education and Culture, 2010). If and when a job seeker finds a job, the family goes where? When? If not at home, everywhere else you are a stranger, it's a universe's spacetime fabric (Overduin, 2007) issue. The tenure jobs are unfrequent occurrence nowadays, increasing stress with 1+ year employment contracts migrating from one place to another living nomadic life with family in rented places and second-hand furniture. The recent pandemic of Coronavirus in 2020 has emphasised the vulnerability of mobile workforce on limited contracts. They are in the limbo between initial home countries where they left from, making a disconnect both on individual and labour market level (Nikoloski, Apostoloska Toshevska, 2019)as well as partial integration in the new home (host) countries and systems.
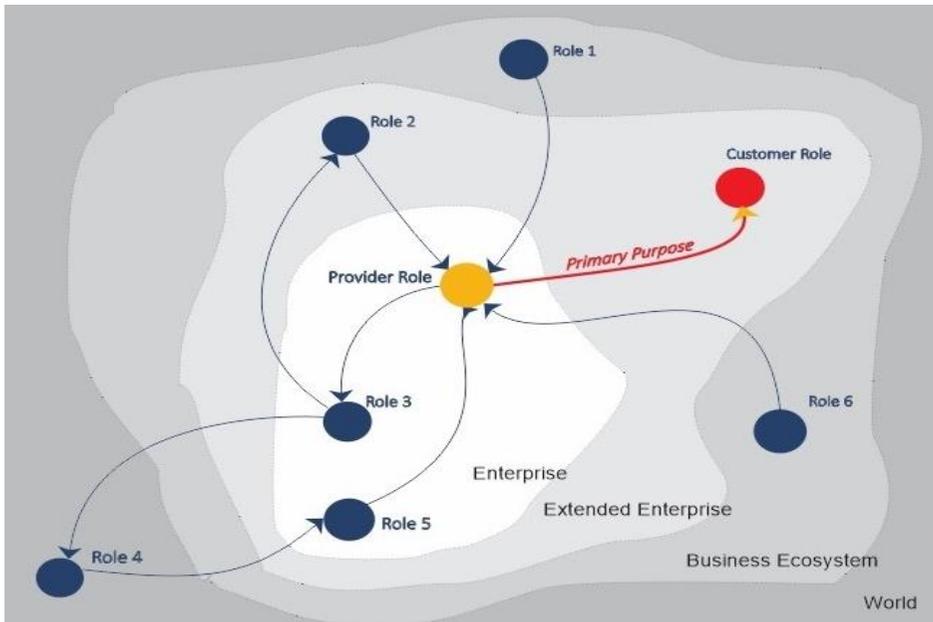
Figure 1. Role-and-Accountability system for tactical management achieving a purpose (strategic goal), with roles positioned throughout the widest business ecosystem (Petrevska Nechkoska, Poels and G. Manceski, 2016)

These proactive hardworking self-motivated workers are among the ones to engage and/or boost bolder action (Wessels, Maurer and Mittag, 1999) to the highly paid and more relaxed EU peers. The mobilization of the workforce is an underlying component for synergic effect. But it has to be directed from developed towards less developed European and EU countries for learning adaptability, challenges, real-life situations and boosting energy and competitiveness of the highly paid and highly skilled workers too (McKinsey Global Institute, 2015).

Figure 2 presents the main components of a method for the tactical manager (the person) that provides adaptability in unpredictable environment. It is consisted of System of Roles-and-Accountabilities, Risk Management, Information Sensors and Information Emitters. The adaptability engine is the SIDA Loop and the improvement engine is PDCA Loop. Co-evolving together for Europe means both the co-creating and growing together. We are far from European synergy and emergent effect. We have numerous valuable segments, departments, organs that have done decent job for their lower-level goals, but we are not facilitating a system of systems. We are designing projects and processes in silos, following job-descriptions (not skills or roles), rigid non-adaptive processes, following-up on plans too late, being very little aware of actual implementation contexts, run-time adjustments (Giannoulis, Petit and Zdravkovic, 2011; Bērziša et al., 2015; Zdravkovic et al., 2013) and risks (Baskerville, Pries-Heje and Venable, 2008; Miller et al., 2005). A project to accomplish the strategic goal of free movement for workers needs a tactical design, with: 1) facilitator (an empowered Project

Manager) having proper authority level not just vertically, but also cross-sectoral and across-silos; 2) competent 'team members'; 3) populating roles to achieve what they are accountable for, and 4) Sense-Interpret-Decide-Act (SIDA) Loop.
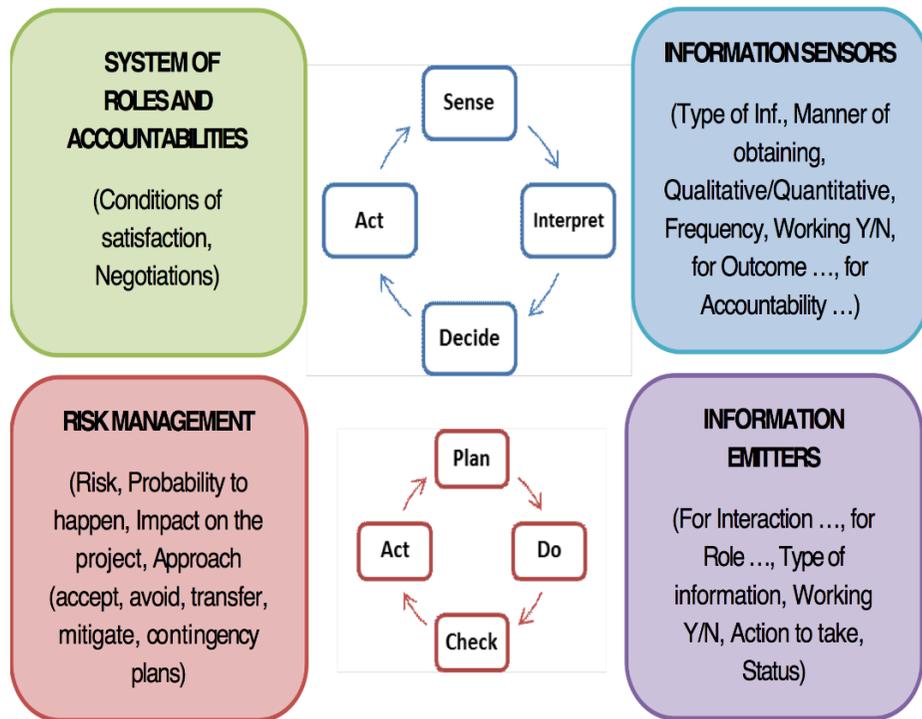

Figure 2. The main components of Tactical Management adaptability and information systems method for managers (Petrevska Nechkoska, 2019)

The latest pandemic of coronavirus in 2019-2020 only enhances the strength for shift of paradigms of engagement, management and strategy implementation. The systemic approach for dealing with shocks of disruptive kind (Hynes et al., 2020) is called for by scholars and practitioners that fuse complexity, systemic thinking and policy making with great potential for addressing global policy challenges in the 21st Century (Hynes et al., 2019) from various contexts and profiles, clearly motivating business as usual as not an option anymore (Kostoska and Kocarev, 2020).

One of the positive instances where the Denica method was used in the prescribed manner discussed in the is position paper in the organisation of the high-level European project implementation that has been triggered by the pandemic of 2020 - the EUvsVirus[4] phenomenon (European Commission, 2020a). The European Commission, led by the European Innovation Council and in close collaboration with the EU member states, hosted a Pan-European Hackathon, Matchathon and EIC covid platform to connect civil society, innovators, partners, and investors

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[4] https://www.euvsvirus.org

across Europe in order to develop innovative solutions for coronavirus-related challenges. The project was organized by the European Commission, led by the European Innovation Council with the patronage of Commissioner for Innovation, Research, Culture, Education and YouthMariya Gabriel, mobilising international contribution of 30.000 volunteers in brief 4 weeks each, through a mission- and impact- driven management and implementation, showcasing beginning to end, as well as top-down, bottom-up and lateral adaptive, iterative and dynamic reconfiguration of capabilities (European Commission, 2020b) (European Commission, 2020c). The freedom of movement was limitless, due to the fact it was virtual collaboration, however, the effects have been remarkable, which makes us question profoundly existing practices on policy implementations. This notion serves as evaluation of the proposed position, and showcases the validity of the suggested approach for addressing organisational complexity.

5. **CONCLUSIONS**

Europe has what it takes to move to the next level - and take everyone along. Co-evolution is the goal, diversity is one input. Leaders, strategy and high quality operations are already in place. Effective and adaptable tactics is missing but there are directions where to search, all along with empowered project management, system view, system design, proper information settings, open communication channels and incorporated risk management. And, above all, awareness of the complexity, interrelatedness and fragility of the adaptive systems we are all part of. The intertwining of strategy, tactics, operations is still inseparable and necessary – yet, these 'islands' are drifting away from each other along with the expansion of universe. Project management (that steers while maneuvering these three managerial functions) is a managerial activity meant to promise effectiveness. Nevertheless, it is 'stuck' in the matrix-organizational structures and silos, complex procedures, duplicated and redundant administrative steps, with both inappropriate authority level (to 'cut' across them) and unsuitable information (or risk awareness and responsiveness). We are spiraling into sub-optimization and developing sub-systems looking from the middle-down or even lower level down. It is therefore recommended that the tactical management systems to be designed from a higher level as possible. It is also noteworthy to mention that a good systems design has controls in place, and when it comes to socio-technical or natural systems, 'knows earlier' in order to take corrective or proactive action. This goes in line with risk management that should not be a separate function, but integrated in the sense-making of every single manager. Finally, information sensors, emitters, risks, roles, and accountabilities are not components to set-and-forget. The important information is not rigid and prescribed; it rather comes in different forms, frequencies, and modes of acquisition. The important information for the citizen, policy-maker, country, union means whether effects are being produced, mission is approaching accomplishment and impact is achieved.

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IMPLEMENTATION OF ELECTRONIC DOCUMENT MANAGEMENT SYSTEM (EDMS) IN MACEDONIAN COMPANIES

Dejan Zdraveski, Margarita Janeska, Kosta Sotiroski

ABSTRACT

Modern working conditions and the great possibilities of electronic communications have a major impact on the need for digital management of the growing number of information. This business information can be in different format: text, tables, graphs, presentations, project documentation, e-mail, audio, video and multimedia contents, etc. Basically, in most cases that are unstructured data, which makes it difficult to use them.The paperwork in companies that has been generated in last decade mostly is generated in an electronic form and is not functionally related to the existing printed documentation. This situation creates a high probability of loss or permanent destruction of a number of significant data. Also, companies have problem with irrational spending of human and material resources and inefficient operations. From this aspect, companies has a need for the application of an Electronic document management system. The application of information technology for document management allows organizations and institutions to increase productivity, efficiency and competitiveness in today's dynamic environment. The main aim of this paper is to understand the significance and level of implementation of the Electronic document management system (EDMS) in various organizations and institutions in the Republic North Macedonia. For that purpose, a survey was conducted that included organizations and institutions from several regions in North Macedonia, from different industries. In the paper will be presented most important aspect of this research through qualitative and quantitative analysis.

Keywords: information technology, document management, standards, competitiveness.

1. INTRODUCTION

Documents are an integral part of any organization, whether it is a business organization, a financial institution, a public service institution, a government organization etc. Documents is part of business processes and depending of the way of their distribution depends the efficiency of the business processes. Traditional document management is known as passive file management. Most users ignore organizational rules regarding document storage. Once users receive the documents relevant to their activity, they tend to gather that information. Traditional document management is paper based, with possible loss, fragmentation of information and

inaccessibility of information. Because of that, the volume and distribution of documents increases. Documents are edited, archived, classified and stored in accordance with predefined rulebooks and regulations. They usually take up a lot of archive space. When all the paperwork is in paper form, especially in large enterprises where we have multiple departments and services, this is often a problem and creates difficulties. The risks of inappropriate DMS implementation are high costs of finding records and information, failure to comply with set standards, inaccurate data in the system, wrong decisions and reduced competitiveness.[5]

Document management systems enable document capture, editing, digital archiving, and document retrieval at the whole organization level. Also, Document Management System (DMS) is a system (based on computer programs in case of digital document management) used for tracking, managing and storing documents and at the same time reduces the amount of paper documentation. With the implementation of document management systems, it is possible to avoid a number of problems that reduce productivity and increase operating costs. Some of these problems can be:

- employees spend too much time searching for documents stored in an inadequate way,

- employees work with the wrong version of documents because at the same time several versions of the same document exist in circulation;

- decisions are made on the basis of outdated or incorrect information,

- unavailability of some documents and information that employees need,

- multiple storage of the same documents, etc.

Implementation of document management systems must be primarily a strategic decision because documents must be treated as strategic resources, and the critical processes involved in them must be optimized. This should integrate document management, business process automation, web content management, scanning and digitization of paper documents, as well as digital archives at the entire organization level. Apart from improving business processes, organizations must implement document management systems and due to legal regulations (Sarbanes-Oxley, Basel 2, etc.) Such rules have as starting points: information management, data security, transparency data flow and control of data and documents. Working in accordance with those rules is necessary a document management system implemented at the whole organization level. Implementation of electronic document management systems provides organizations with many advantages: reduced time costs, optimum space using, transparency increasing, cost

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[5]G.Pećarina: Interaktivni PDF obrasci, Document Management, Zagreb, 2007

savings, minimizing the risk of losing documents and no dependence on a specific location. [6]

2. BASIC FEATURES AND MEANING OF ELECTRONIC DOCUMENT MANAGEMENT SYSTEM

The standard features of a good Document management system should include many functionalities but most important are: object searching, markup functionality, printing, document workflows and lifecycles, document security, document links, document status reporting, issuance/distribution document management and remote access. The purpose of document management is to share information, but also, ensuring the availability of documents. The solution to this situation is an Electronic document management system.

Every company needs some kind of Electronic Document Management System (EDMS) in order to control increasing volume of documents. EDMS can be defined as an automated system which supports the creation, use and maintenance of paper or electronic documents and records for the purposes of an organization's workflow and processes.[7] Companies often oppose "this need" because of the cost and complexity of the EDMS implementation process. Namely, the effective use of EDMS requires great changes in working practices, although most technical aspects are resolved by adopting low-cost databases and easy integration with the Windows environment. Effective EDMS should not only control documents but also provide access to them throughout the company, and even to clients or other project participants through Internet or Extranet. EDMS should also centralize data in easily accessible environment, enabling users to easily store, access, and modify information.

EDMS helps users more easily to perform their work and ensure data security and confidentiality, as well as managing business processes. Many of these functions save time, simplify work, protect the investment made in creating these documents, enforce quality standards and provide control. EDMS has many advantages as:

- Generally efficient location and delivery of documentation

- Ability to manage documents and data regardless of originating system or format

- Ability to integrate computerized and paper based systems

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[6] 482.solutions(2019),The use of Blockchain technology to improve workflow systems, https://482.solutions/wp-content/uploads/2020/01/docmans_eng.pdf

[7] G. Johnston and D. Bowen, "The benefits of electronic records management systems: a general review of published and some unpublished cases". Records Management Journal, 15(3), 2005, pp.131-140.

- Control of access, distribution and modification of documents

- Provision of document editing and mark-up tools

Electronic Document Management System is now becoming one of the fastest growing back office technologies as many companies are beginning to understand that information in electronic format is not only more immediately accessible but it is also more secure and manageable. Some of the more obvious benefits of these systems are[8]:

- Reduce document access and retrieval times - process transactions are quicker, increase productivity and improve customer services

- Provide secure back-up and disaster recovery compliance – much of data is held on vulnerable media that would not survive a disaster, once it's all stored electronically it can be easily backed up

- Make better use of office space – no more need for multiple filing cabinets and document storage cupboards thus reducing office costs

- Help with legal compliance issues – for example the Sarbanes-Oxley Act requires an efficient document retention policy which EDM will help provide

- Improve document security – much of our paper-based information is very sensitive and yet it is not held securely

- Reduce work and document duplication – no more need to make numerous photocopies for distribution

- Reduce paper and printing costs as well as postage

It can be concluded that with the implementation of EDMS the costs of working with the company documentation are significantly reduced, processes are optimized, there is no need to archive printed documentation, it save time for finding documents, it eliminate the loss of documents, and the current version is always available. Proper Electronic document management systems can bring many benefits to the company, but also, and personal benefits in terms of improving business processes and increasing business efficiency.

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[8]https://www.documentsandrecords.com/facts_about_electronic_document_management.html

3. **IMPLEMENTATION OF ELECTRONIC DOCUMENT MANAGEMENT SYSTEM IN COMPANIES AND INSTITUTION IN R. NORTH MACEDONIA**

In the research for implementation of Electronic document management system in companies and institutions in the Republic North Macedonia was conducted a survey using an anonymous structured questionnaire. The questions covered the indicators according to which the level of EDMS implementation can be measured (volume of paper / electronic documentation, use of standards, document management, benefits of using EDMS, etc.). Due to the limited size of this paper, will presented only those issues of crucial importance for the research. The questions that were selected to be presented in this paper emphasize the importance and need for implementation of EDMS in organizations.

The research covered 138 companies and institutions in the Republic North Macedonia. The companies covered by this research were from different industries: financial institutions, public services institutions, manufacturing companies, government organizations and other organizations and institutions (wholesale, educational institutions, trading companies and services, postal service, telecommunications etc). Namely, the largest percentage of respondents are public services institution with 28%, manufacturing companies with 28% and other organizations(wholesale, educational institutions, trading companies and services, postal service, telecommunications etc), also, with 28%. Government organizations with 13% and financial institutions with 4% follow these. This research shows that, 32% of the respondents have 5-10 years of working experience with documents, 29% of the respondents have 5 years of experience, 25% of the respondents have over 20 years and 14% of the respondents have 11-20 years of working experience with documents.

The first question concerns the volume of paper documentation that are in companies and institutions in North Macedonia. This means whether that paper documentation is increasing or decreasing. The results show that significant part of companies or 54% have some reduction in the volume of paper records. This is primarily due to the technology development and implementation of new methods and techniques for gathering and storage of information no matter if they have implemented Electronic document management system. This is shown in Figure 1.
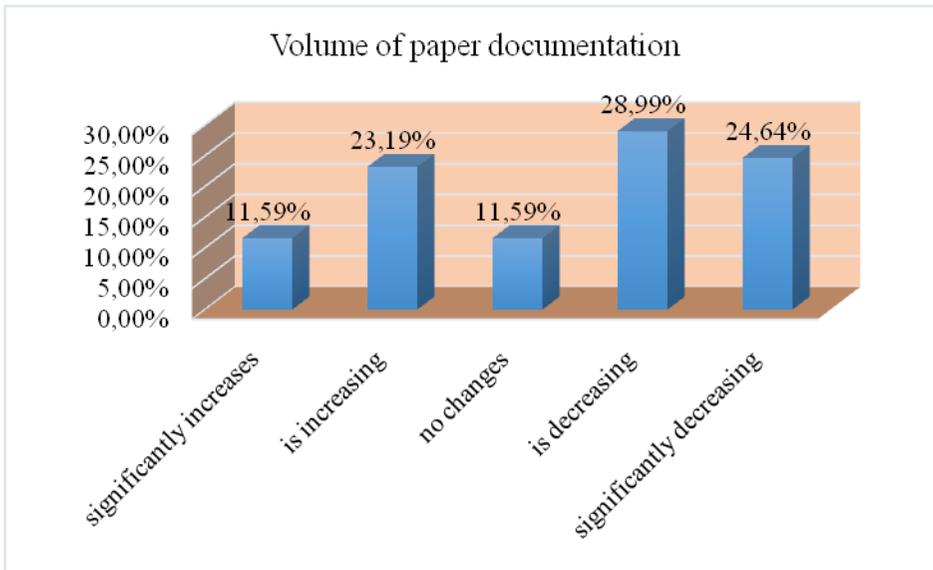
Figure 1. Volume of paper documentation in companies and institution in North Macedonia

The results of the previous question also confirm the answers to the following question, which refers to the volume of electronic documentation in companies and institutions in North Macedonia. Most of the companies and institutions, or 84%, stated that the volume of their electronic documentation is increasing which corresponds to the conclusion of the previous question that companies use advanced techniques for gathering and storage of information. Only a small part of the respondents answered that their electronic documentation is not increasing. These results are presented on Figure 2.

When comparing and analyzing the answers to the previous two questions it can concluded that the reduction in paper documentation is followed by an increase in electronic documentation. This means that a growing number of companies and institutions in North Macedonia use electronic tools for gathering and storing information. This is possible by the increasing development of technology and the modern way of communication between businesses. Most of the communication in today's world means using of ICT tools and most of the business reports resulting from business processes and business applications are in electronic form. It does not necessarily mean that each of these companies or institutions has implemented EDMS, but the modern way of working implies application of new methods and techniques for collecting, storing and managing information.
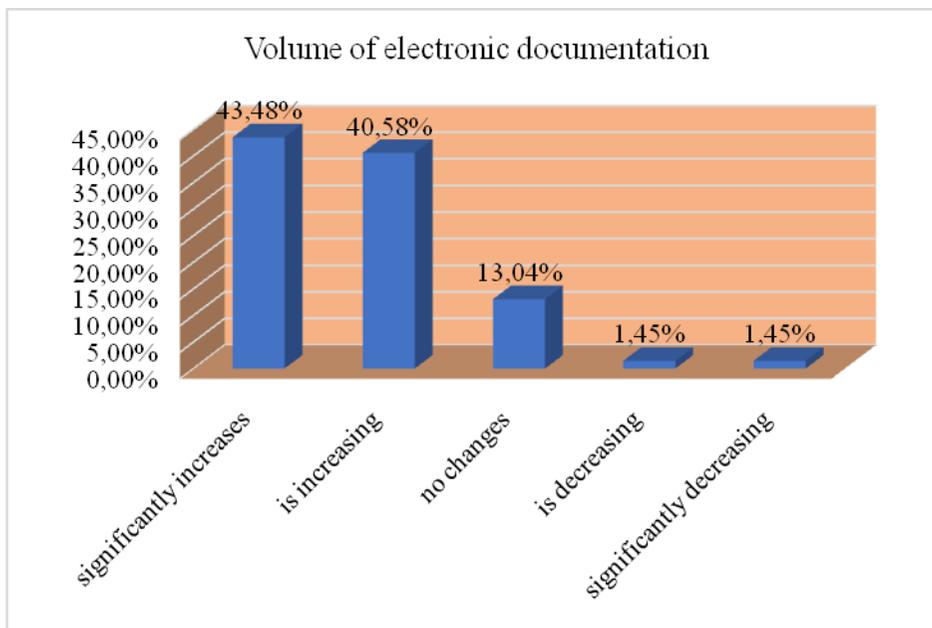
Figure 2. Volume of electronic documentation in companies and institution in North Macedonia

Very interesting is the question for the application of standards in the management of documents and records in companies and institutions in North Macedonia. Perhaps the most important and basic standards for documents and records management are ISO 15489 and ISO 9001. These standards should followed by every company and institution for more efficient management of their own documents and records. ISO 15489 Records management, the first global standard for records management, published in 2001. It was adopted in more than 50 countries and translated to over 15 languages.After a three-year period of review and consultation, a revised version of ISO 15489 Part 1 issued in 2016. It includes core concepts and following principles[9]:

- records, records systems and metadata for records;
- policies, assigned responsibilities, monitoring and training supporting the effective management of records;
- recurrent analysis of business context and the identification of records requirements;
- records controls; and
- processes for creating, capturing and managing records.

The ISO 9001:2015 standard has removed the distinction between documents and records. Both now called "documented information". As per ISO's definition,

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[9]https://committee.iso.org/sites/tc46sc11/home/projects/published/iso-15489-records-management.html

the term "documented information" refers to information that must be controlled and maintained. It is in accordance with the Law on Archive Material in R. North Macedonia. [10]Therefore, it expects that you also maintain and control the medium as well as the information. Documented information is used as evidence of conformance. According to this standard organizations must establish a documented procedure to[11]:

- approving documents for adequacy prior to issue
- review, updating as necessary, and re-approve documents
- identifying the changes and current document revision status
- making relevant documents available at points of use
- ensuring the documents to remain legible and readily identifiable
- identifying external documents and control their distribution
- preventing obsolete documents from unintended use
- applying suitable identification if obsolete documents are retained

The results obtained on the question whether Macedonian companies and institutions follow the world standards for documents and records management is shown in Figure 3. According to these results, unfortunately only 45% of Macedonian companies and institutions follow and comply with these world standards. The rest of the respondents are not familiar with standards or not follow the standards related to documents and records management.
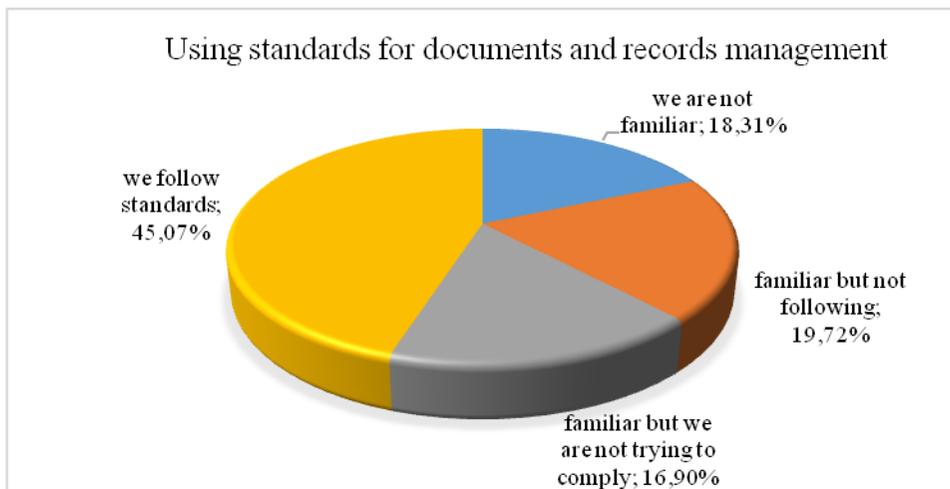

Figure 3. Using standards for documents and records management

Regarding the question "How you managed the documentation generated by business applications and business processes", most of the organizations, i.e. 52%

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[10]http://www.arhiv.gov.mk/materijali/Konsolidiran%20ZakonAM.pdf

[11]https://the9000store.com/articles/iso-9000-tips-document-control-requirements/

responded that the records generated by business applications and business processes are managed by the business application databases. On the other side 31% of respondents answered that documentation are managed as a paper, 10% responded that it was managed as part of EDMS, and only 7% responded that it was outsourced. Of concern is the fact that documentation is managed as part of the Electronic document management system in only in 10% of the researched organizations. The answers are shown in the following graph:
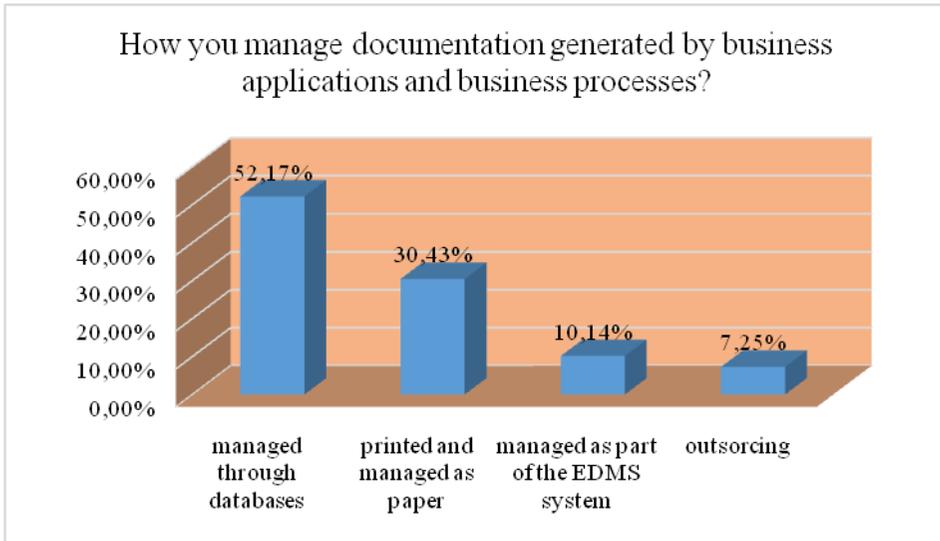

Figure 4. Managing of documentation

From the obtained results can be concluded that only, a small number of companies and institutions in North Macedonia have implemented EDMS. This means that only those 10% who responded that the documentation is managed as part of the EDMS system had implemented Electronic document management system in their operations. Therefore, very few companies have implemented EDMS, although the benefits of using this system are numerous. Companies and institutions are aware of the benefits of using such a system but its implementation is lacking, which may be subject to further research. When referring to the benefits that would gained by using EDMS, companies and institutions stated that those benefits are of great importance that can see from the Figure 5. According to the answers most of organizations for most important benefits is considered increased productivity and better customer services with 23%. Other benefits for companies and institution are: reducing costs with 18,46%, reduce paper storage space with 14,62%, better processing overview with 13,85% and integrated work procedures with 5,38%.
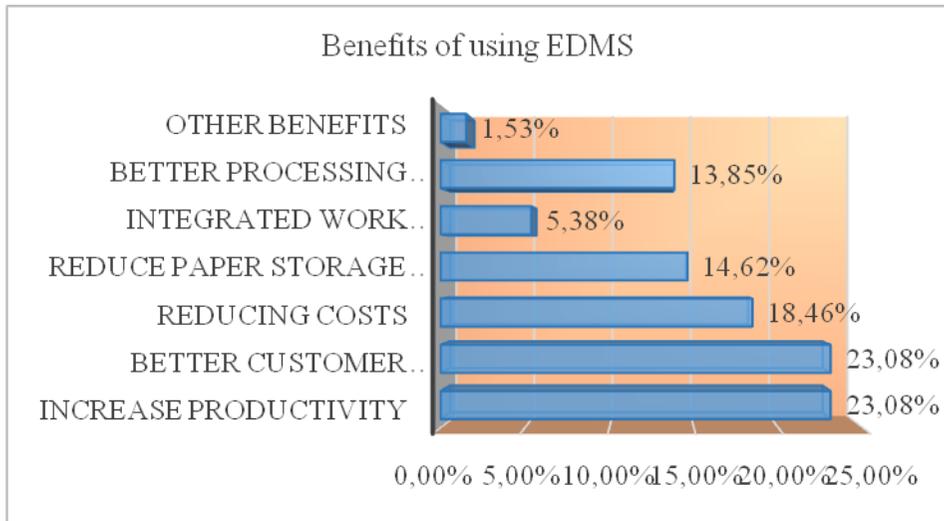
Figure 5. Benefits of using EDMS

However, the support of top management for the implementation of Electronic document management system in companies and institutions in North Macedonia is very encouraging. According to the research, there is a high level of support from the top management for implementation of EDMS, 68.12%. This would mean that most companies and institutions intend to run such a system that would help them in many ways, such as increasing the productivity of their employees, reducing costs, eliminating the storage space of paper documentation, integrating workflows etc.
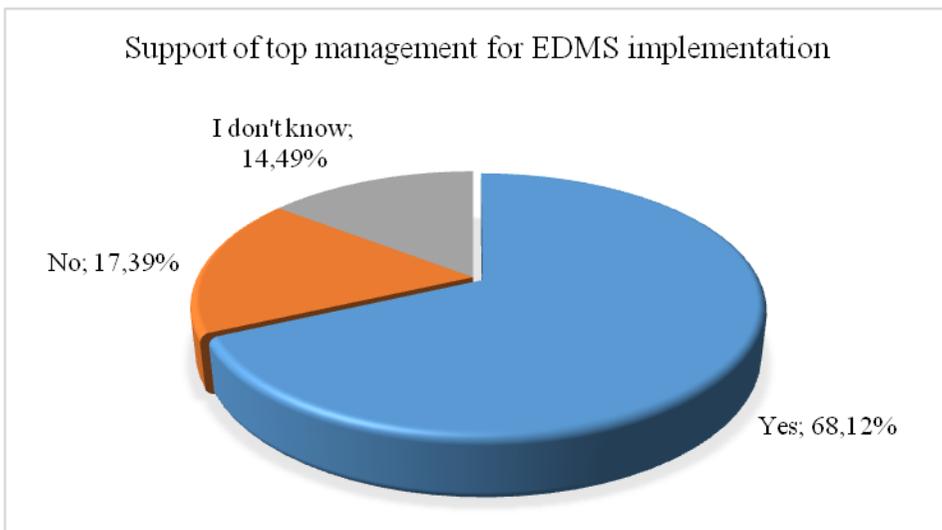

Figure 6. Support of top management for EDMS implementation

4. CONCLUSION

The increasing automation and modernization of business processes in organizations means generating large number of electronic documents and records that obtained in a variety of formats: textual documents created in digital form with the help of various word processing tools, scanned paper documents, web pages, tables and graphs, presentations, project documentation, e-mails, audio, video and multimedia content. Due to such a large amount of documentation, it becomes necessary properly manage with such documentation in order to increase employee productivity, optimize workflows, reduce costs etc.

Often in companies and institutions that have not, implemented EDMS there is a high chance of errors or delays in processing documents. This is due to the enormous amount of documentation in organizations that cannot processed without the use of modern software solutions. Therefore, the implementation of Electronic document management system becomes a necessity for any company if it wants to overcome the problems related to documents and records management.

General conclusion from the research for implementation Electronic document management system in companies and institutions in the Republic North Macedonia is that are made some initial steps in this domain, but it is at a very low level. Namely, organizations are aware of the necessity of applying such a system in terms of quality, efficiency and effectiveness of operation, but still do not apply it at all, or insufficiently. This confirmed by the results obtained with this research. In accordance with the conducted research, in our opinion, this low level of implementation of EDMS is due to the resistance of organizations to change, insufficient monitoring of technology development, insufficiently trained staff for development of such modern software solutions, relatively high cost which implies implementation of new software solutions etc.

Although most of the companies and institutions in North Macedonia have increased electronic documentation, only 10% of them have some form of Electronic document management system. This means that only a handful of organizations manage documents and records through EDMS. Organizations are aware for the benefits of such an advanced document and records management system, but its implementation is lacking. However, the high support from the top management for the implementation of Electronic document management system points to the fact that companies and institutions in North Macedonia will soon decide to introduce this system into their operations.

The contribution of this research is to emphasize the importance of EDMS and its implementation in digitizing documentation in organizations. Also, to realize the benefits offered by the implementation of such a software solution in order to encourage organizations to invest more in such advanced tools.

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http://www.src.si/sr/proizvodi/eoffice

https://www.docme.ru/doc/1476374/sistemi-upravljanja-sadrzajem-%E2%80%93

http://www.interpares.org/ip2/ip2_terminology_db.cfm

file:///C:/Users/Acer/Downloads/05%20Sistemi%20za%20upravljanje%20dokumentima.pdf

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file:///C:/Users/Acer/Downloads/05%20Sistemi%20za%20upravljanje%20dokumentima.pdfhttps://pcpress.rs/spider-za-svetski-vrh/

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USING THE STATCOUNTER AS A WEB ANALYTICAL TOOL TO UNDERSTAND THE WEB VISITORS AND INCREASE THE WEB TRAFFIC

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Snezana Mojsovska-Salamovska

ABSTRACT

The purpose of this paper is to present the opportunities that one of the most important web analytical tools, such as Statcounter, offer to companies and entities in the market, enabling them to maximize the strategic outputs of campaigns based on real data. The accent would be put on the Statcounter, which provides detailed statistics about browser usage and real-time user traffic. For this purpose, Statcounter is used as a web analytics tool for the actual web page, observed in a period of time of one month. Reports for traffic trends will be analyzed in this context, and also attention will be paid on analytical data related to the visitors' location, browsers, platforms, operating systems that they are using etc. Also, the most heavily visited pages would be identified, and recommendations for optimization will be stressed out, in order to achieve maximum impact by viewing the pages of the website ranked by popularity.

Keywords: web analytics, web users, stat counter.

1. INTRODUCTION

Digital marketing is the act of promoting and selling products and services by leveraging online marketing tactics such as social media marketing, search marketing, and email marketing. "Digital marketing has become a new phenomenon that brings together customization and mass distribution to accomplish marketing goals. Technological convergence and the multiplication of devices have led to an openingof the ways in which we think about marketing on the Internet and have pushed the boundaries towards a new concept of digital marketing—user-centered, more measurable, global and interactive."(Carolina Machado, J.Paulo Davim, 2016). In many ways, digital marketing is no different than traditional marketing. In both, smart organizations seek to develop mutually beneficial relationships with prospects, leads, and customers. But digital marketing has replaced most traditional marketing tactics because it's designed to reach today's consumers. As compared to traditional marketing, digital marketing refers to the use of methods and

channels to get a proper understanding in real-time situations. This means that d igital marketing gives businesses the opportunity to access the performance and effectiveness of their marketing campaigns and make adjustments accordingly.

Digital marketing is a digital identity of a company through which it presents itself in the virtual world to an enormous number of users. Thanks to a digital technology, a brand can reach each consumer with its products. (Sawitcki, 2016)The use of digital marketing in the digital era not only allows for brands to market their products and services but also offers online customer support through 24x7 services to make the customer feel supported and valued. Digital marketing provides increased advantage for brands and businesses. It is now common for consumers to post feedback online through social media sources, blogs, and websites about their experience with a product or brand.

Digital marketer must also use measurable analytics to identify weaknesses and find ways to improve performance across these channels. In this sense, companycan be responsible for all aspects of a company's digital strategy or just focus on one.

According to(Bekavac, Garbin, 2015), the use of web analytics tools in business fields, as expected, is most frequent in the marketing industry.

Digital marketing goals are:
- To increase website traffic,
- For brand promotion or brand awareness,
- To improve quality of customers,
- To improve search engine ranking,
- To get best ROI result,
- To find loyal and potential customers, etc.

Every company has specific business goals. In order for a Website to be beneficial, information gathered from its visitors must not merely show what has happened in the past, but it must also be able to improve the site for future visitors. The company must have clearly defined goals for the future and use this information to support strategies that will help it achieve those goals, according to(Both, Jansen, 2009),

Why companies need to be online(Jones, Malczyk, Beneke, 2011):

1. The market and competitors are already there. If you market and sell products or services to a middle-class clientele, you need to extend your strategy to include the internet.

2. Web users expect the highest convenience and information at their fingertips. All companies need a website as their central point of contact. If your details don't come up in a web search, you will be ignored.

3. Customers are inconsistent. They will not expend a lot of energy to find you online. Even worse, if your competitor is easy to find online, your potential customers will happily turn to them.

4. Audiences want to interact with and converse about your brand and products. Give them the opportunity to do it in a mediated space, and become part of the discussion.

2. WEB ANALITICS TOOLS

Web analytics tools provide better understanding of how visitors are finding the website, how they interact with it, and ultimately, how effectively the website is contributing to your business goals.

According toWaisberg and Kaushik (2009) web analytics is not a technology for just reporting, but a cyclical process of website optimization which, among other things, measures costs, identifies the most profitable user behavior and optimizes a website by improving performance and profitability. In this section we will shortly elaborate the most used web analytics tool on the market. Some of them provide similar data, but they have different approaches and generated different kind of data. Web Analytics provides data about the website as well as the visitors. The web analytics program will provide businesses with information about the audience, audience behavior, and campaign -related data.(Hoang, Nguyen, Trang, 2017)

Information related to the site's audience may include:
• Number of visitors to the site
• How many new people and how many people turn around?
• They come from which part of the country
• What web browser do they use?

Site behavior can include:
• What did they see when they visited the site?
• How did they get to the site?
• What content is more attractive and popular?
• How much time they spend on the site?

Information about campaign data on the site may include:
• Which marketing campaign is more effective?
• Which campaign brings more visitors to the site?
• Keywords searched by visitors can find the site

The popularity of web analytics is increasing both in the usage of web analytics and companies providing web analytics tools. New web analytic services

seem to be popping up in the Internet frequently. The estimated value of web analytics market will be close to 3 billion euros in 2019. As(Nakatani, Chuang, 2011) noted the use of web analytics can be central method in creating competitive advantage in the rapidly evolving world. Carefully selecting the web analytics tools is vital as the decisions made in the selecting the tools can have long term influences for the business. From this viewpoint, it is also important to consider what web analytics service or software will be adopted.

Therefore, web analytics plays an important role in measuring the site as it measures every detail of the site.

*Google Analytics.*One of the most common and vastly used free web statistics tools, which provide a number of features that are useful for every kind of website, is google analytics tool. This tool tracks the web traffic source, count, on-site behavior, number of clicks, conversions and much more.

Image 1 Google analytics tool
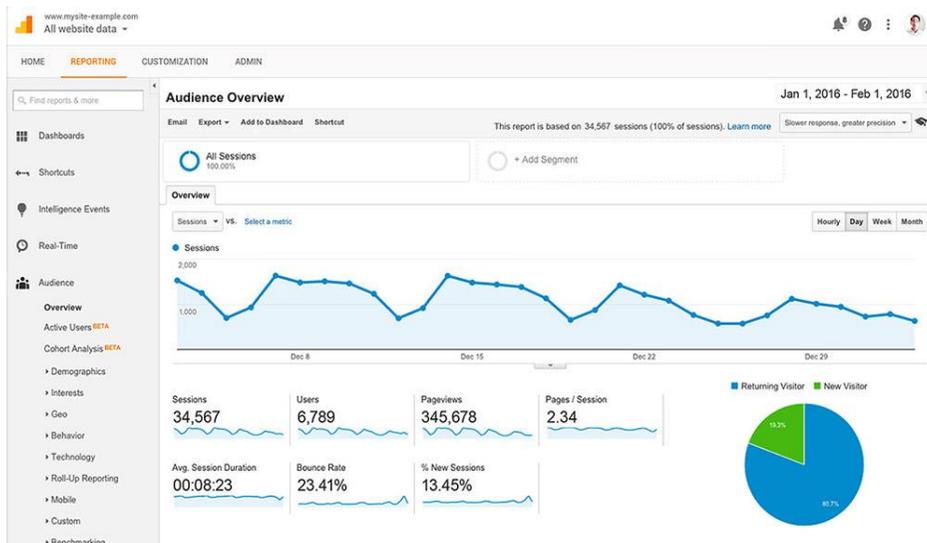
Google Analytics also offers some suggestions to improve your conversation rate and improve your website for better ranking in the search engine. This includes tips on fast-moving up the website, managing content, insight on visitor's behaviour and benchmarking tools. **AWStats.** This is an open-source analytics tool that can analyse multiple websites running on one server. To use it, the web host must log web data to a file that the tool could read from. Visits count, time spent on the website, bandwidth usage, entry/exit pages, OS and bandwidth used for each, "bot visit" tracking, and protection against worms attack, keyword tracking and bookmark tracking are some of its features that I found to be most interesting. Though not really a downside, but AWStats does not offer too many advanced

features. **JetPack for WordPress**Apart from other features, JetPack offers basic web analytics and its simple interface makes it easily usable for beginners.

Image 2 Jetpack analytic tool

With the help of JetPack plugin you can see total visits of individual posts, popular pages, keyword tracking, subscriptions tracking, visitor location, on-site behaviour and more. Though for beginner users JetPack can be a advantage, for users who require detailed and advanced statistics about their website, this may not be a very good option. **Open Web Analytics.** One more open-source analytics tool. Its features include, traffic count, multiple website analytics support, monitor individual visitor behaviour, track clicks, view heat maps, track subscriptions, repeated visitor's activity over time, track entry/exits and more. **W3schools**. This analytics tool has more than 50 million visitors per month and that too to just look into browser statistics. That's how much browser usage statistics are important to the businesses. They have very simplified and neat home page that lists all the prominent browsers and show their user stats in an organized manner.**Clicky.**Clicky is a very simplified analytics tool that comes up with a neat interface reducing all the unnecessary details. They provide you with Powerful API. Twitter analytics, Google search rankings, Video analytics, Big screen mode, Sub-users, The best bounce rate in the biz, HTTPS tracking. According to(Booth, Jansen,2009)the first step in analysing theWebsite and Website visitors is understanding and analysing your business goals and then using that information to carefully choose your metrics. In order to take full advantage of the information gathered from web site's visitors, the company must consider alternative methods such as focus groups and

online surveys, make site improvements gradually, hire a full-time analyst, and realize that your site's improvement is a process and not a one-time activity.

3. STATCOUNTER AS A TOOL FOR ANALIZING THE AN ACTUAL WEB PAGE

StatCounter. Stat Counter is a tool that provides deeper analytics about the website along with features to increase web traffic, generates sales leads, and detects click frauds. It could be also configured, to send custom summaries every week via email to get a quick glance at how things are going. Stat Counter's advanced features include an invisible counter, tracking the activity of visitors before and after visiting the website, heat maps, search engine comparison, tracking HTTPS websites, sharing access with team members, displaying the web stats publicly, checking JavaScript stats. However, Stat Counter's free option can only be used for tracking for up to 250,000 visitors per month. So it can only be a good free analytics tool if you have a medium-sized blog.

For the purpose of this paper we will use Statcounter, (among many others web analytics tools) as a web analytics tool to generate data from an actual web page www.vegansproducts.com (the page that promotes vegan lifestyle, vegans products, animal liberations activism, stop animal abuse, stop diary consuming)

Image 3 Web traffic
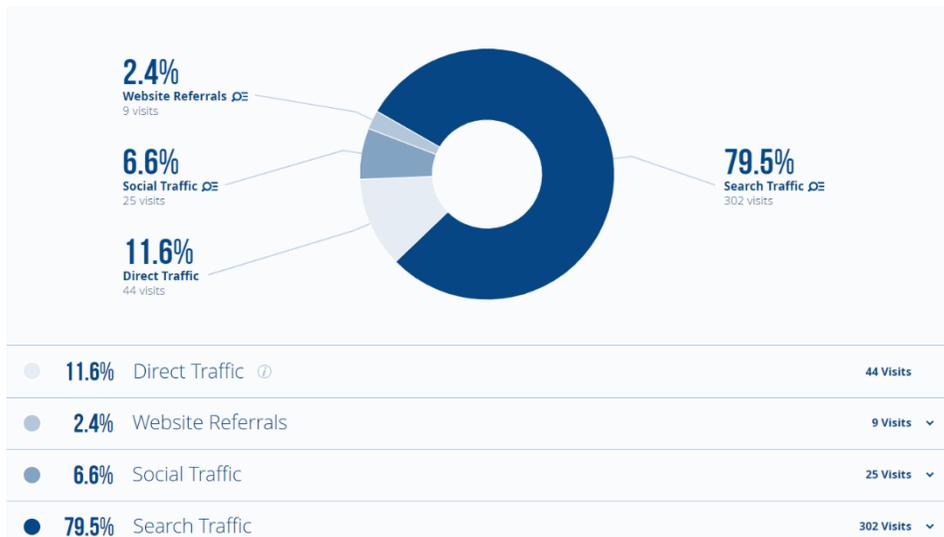
Source: www.vegansproduct.com

As we can see from the **image 1** 79.5% of the users(visitors of the page) are from **search traffic,** which means that people arrived to the site after clicking search engines listing results. They searched for something and then decided to make a visit; 11.6 % of the users are from **Direct traffic** (Visitors who visited the site by typing the URL directly into their browser.). If you are missing direct traffic,

then you will have to work on customer retention through keeping relevant and current information on your website, such as having a blog that people can subscribe to. URLs with high return rates suggest webpages that have been favorites or included in email. Than 6,6 % of the users are from**Social traffic** (Visits from social networks/sites such as Facebook, Instagram, Pinterest, Twitter, you tube etc.)and 2.4 % of the users are from Website referrals. Referral traffic is used to describe visitors to your site that come from direct links on other websites rather than directly or from searches. If the referring sites are low, you may want to encourage companies that sponsor, donate, or volunteer to include a link from their organization's website to your website. Social media campaigns can also help in promoting the website.

Image 4 Page views

Source: www.vegansproduct.com

The second image shows the Line chart for four parameters >**Page views, Sessions, Visitors, New Visitors** for the 2019, exactly until September. The line chart shows that in January the page had most page views (Each time a page is viewed on the website by any visitor, it is called a Page View.) over 3.8k. Then, in February decline process started with 699 visitors (A visitor represents a unique person visiting the website for that day, week or month. In short, a single visitor can have multiple sessions with multiple page views from each of those sessions.). But in March the page views increased to 2.4 k, and new visitors, which is somebody who had never visited your website on a different day, week, or month before, to 1.5 k. The sessions in January were 3.k , but in June are 1.6. This means that someone visits your website, browses one or more pages. The sessions can be increased by advertising, creating new content, also we can get more out of the existing content by optimizing for specific keywords and adding supporting meta descriptions, headlines, internal links, image alt text, and more to increase the search visibility of important pages on the website and build external links.

Image 5 Visit Length   *Image 6 Browsers*
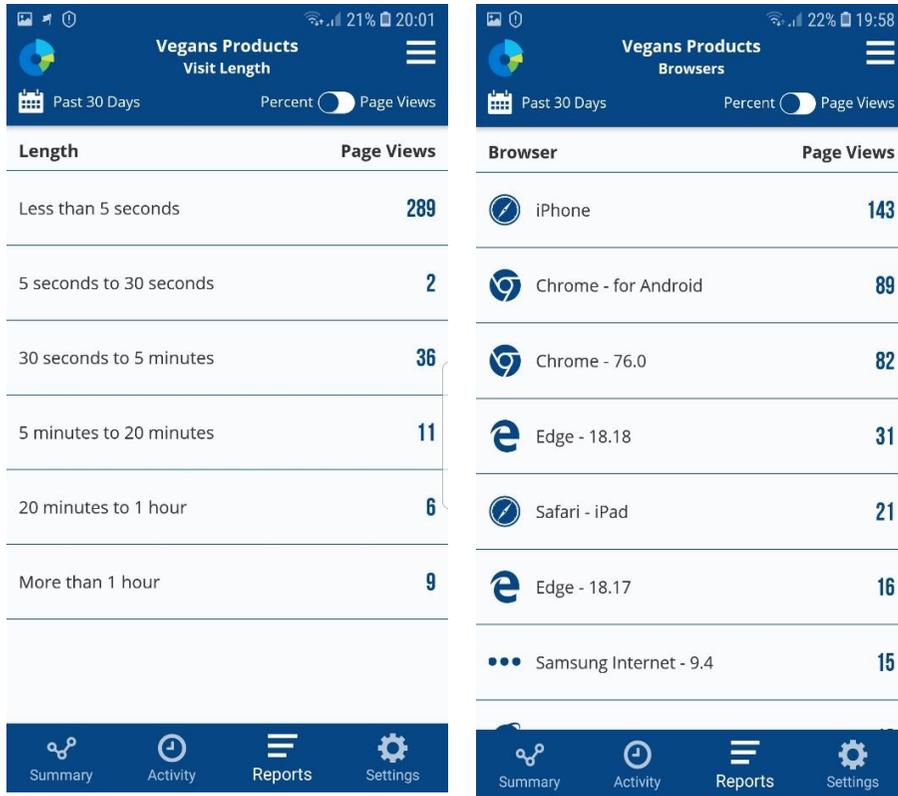
Source: www.vegansproduct.comSource: www.vegansproduct.com

In the image 5, data for the length of the page views are presented, and, as shown here 289 visitors stay on the page less than 5 seconds, 2 visitors stay from 5 seconds to 30 seconds, 36 visitors stay from 30 seconds to 5 minutes, 11 visitors stay from 5 minutes to 20 minutes, 6 visitors stay from 20 minutes to an hour and 9 visitors stay for more than an hour. Good average page view per visit is about 3-4 page views per visit with length 1.5 - 2 minutes. Usually, company can get high page views per visit on the wallpaper/videos/media blogs. In the next image we have data for the browsers that visitors use when they browse the page www.vegansproducts.com. The most used browser is iPhone used by 143 visitors, than Chrome- for Android, used by 89 visitors, Chrome - 76.0 used by 82 visitors, Edge- 18.18 used by 31 visitors, Safari – iPad 21, etc. the type of browsers that visitors use are directly connected with mobile devices that they use when they visit the page.

Image 7 Search Engine   *Image 8 Operating System*


Source: www.vegansproduct.comSource: www.vegansproduct.com

Also, Statcounter generated data about the operating system they use and the search engine that visitors use when they visit the page. The image shows us that the most used operating system is IOS (153 users), than Android (108), Win 10 (102), win 7 (350 OS X (23) which is corresponding with the mobile devices that visitors use. As we can see from the image7 about which search engine visitors use, the answer is that they are using Google with 233 visitors, then Bing 22 visitors, Google Uk 13 visitors, Google Au 8, than Ecosia, Duckduckgo, etc. If the traffic from search engines is low, having other company put links to the website on their websites also increases the likelihood that search engines will list your website higher in the results. Also, you can incorporate more meta tags in order to include more key words that when searched for in a search engine will bring up your website. „As you learn more about the value of SEO and how it integrates into the web, you should be able to increase your income or social reach significantly. Only by pairing SEO with other marketing methods or viewing the web through a larger lens will you be able to fully appreciate the value of SEO". (Wall, 2005)

Image 9 Countries   *Image 10 Mobile devices*

Source: www.vegansproduct.com Source: www.vegansproduct.com

In the image 10 we can see where the most users come from. The page www.vegansproducts.com is visited by users from the USA - 211 users, then UK - 48 users, Australia - 23 users, Singapore - 22 users, Israel - 18,India - 17 users, Canada - 16 users. This data is very important for the business, tbecause. Identifying a target audience of consumers is among the most crucial elements for a business operator to consider. Without knowing the target market, or whether an audience even exists, you can't realistically expect your business project to survive. "The idea is, the product we are selling to be seen by the customer that wants to buy the product. So, targeting audience is very important part of every online business, because if company does not target the audience, nobody will see the web page or the product ."(Gligorovski, Mancheski, Angeleski, 2018) Statcounter generated data about the most used brands of mobile devices when users approach the web page. As we can see in the image,the top brand that the customers regarding mobile devices is Apple iPhone (153 users), than Apple iPad (21 users), Samsung (18 users), Samsung Galaxy Tab S2 9.7 (10 users), Samsung Galaxy S9 (9 users), Huawei Y5(6 users), Nokia (5 users), Samsung Galaxy S8 (4 users), Samsung Galaxy S7 (3 users), Motorola (3 users) etc. With this data we did a small research about usage of mobile devices, so this data can be interesting for mobile companies.

4. CONCLUTIONS

Why is it important to use analytics tool for the business decisions? When it comes to making business decisions, it's important to make sure that the decision made doesn't disappoint your current customers, but rather increases their user experience. To make a safe and informed decision, the company need, to know as visitors first. Using analytics allows the business to develop an effective digital strategy and also to add new elements to the whole marketing/business strategy in the future. Also, when company learn about the technology (device, operating system, and browsers), as show, in this paper, they're using to browse the site; test the site's compatibility with those technologies and make required developments. Search engine optimization (SEO) is one of the most crucial aspects in determining the business growth. The more organic traffic the business site receives, the more leads and conversions it gains.

When company has that information, it can decide to build stronger links with external partners, include call to action links on social media or measure online advertising campaigns for success in achieving your goals, helping you to measure a ROI on those campaigns. Analytical systems can tell which regions and cities the visitors are visiting from, which opens up new questions and possibilities for doing business. Online marketing analytics helps to discover potentials that a companymay not have thought of without the information at its fingertips, which is always a great way to help the business grow and develop in the future.

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