Digital Systems and New Challenges of Financial Management – FinTech, XBRL, Blockchain and Cryptocurrencies

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Abstract

Management of public finance and economic development is the art by which a nation improves the economic, political and social well-being of its people. The research paper starts from the reality that finance plays an important role in each economy. Nowadays, finance has to manage and adapt to Digital Era. The purpose of this paper is an attempt to identify and encourage managing financial statements through artificial intelligence using XBRL and Blockchain. In many countries, financial and tax authorities encourage the adoption of eXtensible Business Reporting Language (XBRL) and Blockchain. XBRL enable business to generate their required reporting information directly from their financial data. Blockchain technology continues to grow and it is being used in more and more business sectors. Finance, accounting and auditing has been identified as areas that could greatly benefit the distributed registry and other features of Blockchain. The main benefits generated by these innovative tools include reducing the risk of error (especially human error); low risk of fraud; system automation, big data analysis, huge cost savings (by increasing the efficiency and decreasing in errors), increased reliability in financial reports, and reduced workflow. The research paper comes to present how artificial intelligence combine financial information with tech capabilities, accelerate digital transformation of finance and accounting, and may create a more safety business and economic environment, reducing human error. We have to manage our work and time differently. We are living in a digital and intelligent era, where machines take over repetitive, time-consuming and redundant tasks, giving finance professionals more time to approach higher level and more lucrative analysis and research.

Keywords: management of finance; artificial intelligence; XBRL, Blockchain; digital finance; error reduction.

1. Introduction

The internationalization of financial markets is having profound effects on all countries. Foreign investors and international bodies provide funds to corporations in certain countries, helping finance existing businesses, open new ones or helping the government (by investing in Treasury or municipality bonds). Without these foreign flows of funds, the economies would have grown far less rapidly in the past 20 years. The internationalization of financial markets is also leading the way to a more integrated world economy in which flows of goods and technology between countries are more commonplace (Greenbaum, et al., 2016). Internationalization of financial markets brought many benefit to investors and countries in the same time. International financial facilitates trade, risk management improvement, mobilizes resources, and acquires and processes information that helps in the allocation of capital.

Informatization and computerization of society is one of the most important processes of present, everywhere around the world. Opportunities for new activities open up, while the information and technological environment as such contains the potential danger of deformations in the structure of personality and the ways of its social integration. In this regard, there is reason to assume that the development of information technologies in our modern age has both constructive and deconstructive consequences for a person or for a business (Lokova, et al., 2018). Management of finance faces new risks coming from implementation of artificial intelligence or digital systems.

The changing world affects the economic development, taking different meanings and techniques. We are hearing about the presence of artificial intelligence in all economic sectors, and it already part of our day-to-day life, in one way or another. The research paper comes to present how artificial intelligence combine financial information with tech capabilities, it accelerates digital transformation of finance and accounting, and it may create a safer business and economic environment, reducing human error. Artificial intelligence is an aptitude demonstrated by machines, in contrast to the natural intelligence displayed by humans and other animals. Using the most innovative technologies, we can find new business solutions and solve problems that until now seem hard to fix. *Artificial intelligence*, through knowledge management, links machines, IT, new technologies and businesses. No matter the economic sector, the size and the geographical location, all business are still facing the same issue: preparation of financial statement, accounting bookkeeping compliance with international GAAPs, human error, and an accurate comparison financial analyse. *Artificial intelligence* comes to bring digital solutions: *eXtensible Business Reporting Language* (XBRL) and *Blockchain*. Investments through financial capital infusion, lead to increase of production, consumption, and income in private, and public sector (Moşteanu, AlGhaddaf, 2019). Therefore, according to the Government's requirements, we need a standardized tool to submit all the financial accounting reports required by law –

XBRL. The most developed countries (from Europe, Middle East and USA) are already using XBRL in their financial statements.

2. Literature review – Digital finance – the base for XBRL and Blockchain

2.1. Digital-Financial Markets – FinTech

The most valuable derivative of digitization is the rich pool of gathered data, which is growing very fast. Advanced computing capability has paved the way for *big data* analytics. Social media, mobile, analytics and cloud (SMAC) and application program interface (API) technologies have allowed different data streams to talk to each other in a highly efficient manner. This has led to the integration of multiple services into a single platform, thus creating a plethora of cases for digital financial services – fueling the *app economy* (Economic Corporate Network, 2016).

To remain competitive and achieve longevity in the market, financial services has to keep up with digital transformation. The survival of financial institutions is connected with the adoption of innovation, and embracing digital changes, to improve the efficiency and the performance within the organization (Scardovi, 2017). Digital transformation and new technology adoption have changed the way of doing business and channels that offer banking and financial products and services are more intuitive and trustworthy (Mohamed, Ali, 2019).

Digital systems are becoming more and more used, representing a much faster, cheaper and safer way when it comes to financial transactions. Access to modern telecommunications systems is a priority in all countries around the world, as in their evolution, financial and banking systems implement, use and encourage online services for domestic and international financial transfers. Digitization and digital transformation have become the most commonly used words in the last decade, but especially in recent years. There is an excess of definitions of this term, used to describe the offline-to-online migration of commercial operations and businesses, including those found in many published research works. Contemporaneous economists defined digitalization as *the realignment of, or new investment in, advanced technology and business models to more effectively engage digital customers at every touchpoint in the customer experience lifecycle* (Solis, Littleton, 2017).

Financial technology – *FinTech* refers to an emerging financial services sector that is becoming increasingly indispensable to financial institutions and has a steady impact on how technology supports or allows banking and financial services. Fintech, Financial Technology targets construction systems that model, value and process financial products, such as shares, bonds, money and contracts. Contemporary economists define Fintech as a *new financial industry that applies technology to improve financial activities* (Schueffel, 2016). Currently financial technologies are used by all types of business, from start-up to large corporations, in all economic sectors.

2.2. Artificial Intelligence

The digital revolution is changing the way of living, working and communicating. The transformation, that takes place within the telecommunications industry, it has a great impact on the surrounding world with the emergence and continued improvement of digital technologies (Zhao, 2018). *Artificial Intelligence* is one of them. It is a recent technological breakthrough, which, combined with industrial technology, it helps overcoming many human errors, exceeding human performance in different areas. IT programs are becoming more accurate, detecting and scaling objects better than human performance. Speech recognition systems can now identify the language of telephone calls and voice recordings with levels of accuracy that match human abilities. Translating from one language into another is now done in real time, using a simple application on the phone. Glasses can be connected directly to google map or other search program. All of these are already part of our lives. *Artificial Intelligence* solutions have the potential to transform such diverse and critical areas as education, research, healthcare, finance, accounting, auditing, transport and energy. It is not a single technology but a family of technologies. In addition, *Artificial Intelligence* solutions can help sustainable, rapid and viable regional development. The regional economic disparities that exist in different areas of the world can be diminished considerably. Therefore, *Artificial Intelligence* can help to successfully implement regional development policy objectives (Moşteanu, 2019), regardless the geographical area, the spoken language or the sectors of predominant activity. In many countries/regions public authorities require the application of the XBRL to enhance business operations and transparency, with the aim to advance their market's standing in the eyes of investors.

The history of *Artificial Intelligence* started around 100 years ago, in 1920, when Czech writer Karel Čapek published a science-fiction piece called Rossumovi Universal Robots, which introduced the word *robot*, a humanoid *machine* which work for people (Turing, 1950). In 1950, Alan Turing (mathematician, computer scientist, logician and cryptanalyst) asked himself (publically) *Can machines think?* (Koistinen, 2016), and from this question the *Artificial Intelligence* started its journey. Turing continued to develop three distinct strategies that might be considered capable of reaching a thinking machine: through programming; *ab initio* of machine learning (Koistinen, 2016); and, knowledge management (using logic, probabilities, learning skills). As a result of discoveries in neurology, information theory and cybernetics in the same time, researches, and with them Alan Turing, created the idea that it is possible to build an *electronic brain*. Turing introduced his widely known Turing Test, which was an attempt to define machines' intelligence. The idea behind the test was to call machines (e.g. a computer) *intelligent*. If a machine (A) and a person (B) communicate through natural language and a second person (C), a so-called elevator, cannot detect which communicator (A or B) is the machine (Schultebraucks, 2018). And the research continued. On 11 May 1997 IBM's chess computer defeated Garry Kasparov after six games. In the last two decades, *Artificial intelligence* has grown heavily. The Artificial Intelligent market (hardware and software) has reached $9 billion in 2018 and the research firm IDC (International Data Corporation) predicts that the market will be $47 billion by 2020. This all is possible through knowledge management to explore Big Data, and take advantage of faster computers and advancements in machine learning techniques (Schultebraucks, 2018).

2.3. eXtensible Business Reporting Language (XBRL)

eXtensible Business Reporting Language – XBRL – is a language used for electronic communication of business and financial data, which is revolutionizing business reporting around the world. XBRL enable business to generate their required reporting information directly from their financial data. It is a consistent tool also useful for comparability and overall business evaluation.

The birth of modern accounting had its origins in the Italian Renaissance where the favorable climate existed for double entry bookkeeping to be developed. In 1458, Luca Pacioli wrote his fifth book, Summa de Arithmetica, Geometria, Proportioni et Proportionalita (Everything about Arithmetic, Geometry and Proportions). This was the first book on Algebra and it is the first systematic documented source of double entry bookkeeping method. Its basics are familiar and similar in the modern accounting system, but the rules of accounting have been developed over the years, especially in the last 40 years. Now the accounting rulebook has expanded to over 4,000 pages, and is perpetually changing to accommodate new business

practices. The use of a standardized coding structure, such as XBRL would help to reduce these wage expenses by removing the replication of data-entry over many channels, and reducing lost data costs. In 2000, an accounting industry specific language was released, this was version 1.0 and it was renamed the eXtensible Business Reporting Language, what we called now XBRL (Kloeden, 2006). In 1999, the American Institute of Certified Public Accountants, six information technology companies, and experts reported that they had joined forces in an attempt to develop an XML-based Financial Reporting Language and extend XBRL internationally for use in business reporting. If the *father of accounting* is Luca Pacioli, the *fathers of XBRL* are Charles Hoffman and Wayne Harding (Hoffman, Strand, 2001). The American Institute of Certified Public Accountants was receptive to this idea and funded the creation of a prototype, once a plan was presented. When the prototype was finished, the AICPA created and promoted XBRL International. The group was formed as a not-for-profit global consortium of companies and agencies with one common goal, the development of XBRL and the widespread acceptance and use of the new global coding standardization process for financial information (Tie, 2005). Currently, XBRL is used by more than 100 regulators in over 60 countries (Europe, Middle East and Asia, North and South of America), supported by over 200 software packages and a growing number of companies, to facilitate structured data reporting across millions of companies (Nitchman, 2016).

2.4. Blockchain

Blockchain is another newest technology, which enable businesses to generate their required reporting information directly from their financial data. Blockchain technology continues to grow and it is being used in more and more business sectors, finance, accounting and auditing has been identified as areas that could greatly benefit the distributed registry and other features of this one.

Blockchain is a new technology that was introduced a decade ago, after financial crisis of 2008 (Nakamoto, 2008), and there is still a long way to be accepted and adopted by everyone. Blockchain can be described as the chronological record of block transactions. To ensure transactions, the cryptography is used, based on a chain of digital signatures. Each block is a group of transactions that are added to the last block by reaching a consensus on its authenticity among users, which is then passed to each network user to update their database. The Blockchain system records all transactions ever made, shared by consensus distributed and shared among each participant's users, and it is very difficult to force it. Since every two-key sign-in and any transactions are cryptographed and simultaneously maintained in distributed ledgers of each Node, which make this almost impossible to be hacked. Nowadays double-entry bookkeeping it is not an absolute system but it is logically extendible to triple-bookkeeping by including a set of *force* in its third axis (Yuji, 1982, 1986). In the accounting industry, Blockchain helps the companies to write their transactions directly into a join bookkeeping, creating an interlocking system of enduring accounting records. Double entry accounting has been used for a very long time now. Triple entry accounting adds a level of clarity and honesty to bookkeeping that double-entry accounting cannot offer (Faccia, Moşteanu, 2019).

2.5. Cryptocurrencies

As digital finance and artificial intelligence occupy an increasingly important place in the financial services market over the last decade, cryptocurrencies appear too. *Cryptocurrencies* are virtual digital currencies and named as such because cryptographic techniques lie at the heart of their implementation (He et al., 2016). Historically, the idea and concept of storing

important information by using cryptographic techniques is considered older, as the term crypto is taken from an ancient Greek word Kryptos, which means *hidden*. World Bank classified cryptocurrencies as a subset of digital currencies, which it defines as digital representations of value that are denominated in their own unit of account, distinct from e-money, which is simply a digital payment mechanism, representing and denominated in fiat money. In contrast to most other policy makers, the World Bank has also defined cryptocurrencies itself as digital currencies that rely on cryptographic techniques to achieve consensus. Today, the advent of cryptocurrencies is traced to the emergence of the first cryptocurrency, that is, bitcoin in 2009. After the emergence of *bitcoin* in 2009, the experiments in cryptocurrencies started happening in 2011 with the release of SolidCoin, iXcoin, Namecoin, and others. As of August 1, 2018, there are more than 1,737 different cryptocurrencies in the market. This number of cryptocurrencies breaks down into 819 coins and 918 tokens. According to CoinMarketCap data, the combined market of overall cryptocurrencies to date is valued at $269 billion (Mohamed, Ali, 2019).

Central banks have started to consider whether they might issue digital currencies of their own. Due to the advent of cryptocurrencies and blockchain technology, the central banks of major economies started to think and work on their own Central Bank's Digital Currency (CBDC) (Mohamed, Ali, 2019). A fundamental matter raised by CBDC issuance relates to the appropriate roles – in financial intermediation and the economy at large – of private financial market participants, governments and central banks. With CBDCs, there could be a larger role for central banks in financial intermediation. As the demand for CBDC grows, and if holdings of cash do not decline in lockstep, central banks might need to acquire (or accept as collateral) additional sovereign claims and, depending on size, private assets (e.g. securitized mortgages, exchange-traded funds and others). If demand becomes very large, central banks may need to hold less liquid and riskier securities, thereby influencing the prices of such securities and potentially affecting market functioning. Central banks may also need to provide substantial maturity, liquidity and credit risk transformation at times to both banks and markets. Since central banks could assume more important roles, they could have a larger impact on lending and financial conditions (Committee on Payments and Market Infrastructures, 2018).

3. Research Methodology

The present work paper is an exploratory research, based on investigative techniques. It is a fundamental and qualitative research, which aims to identify and encourage managing new financial methods through artificial intelligence and digital systems to achieve an efficient sustainable economic development. The paper present the new approach of finance and the necessity to review and adapt the management and supervision of financial institutions, markets and their services provided. The research paper comes to present how artificial intelligence combine financial information with tech capabilities, accelerate digital transformation of finance to create a more safety business and economic environment, reducing human error.

4. Findings and Conclusions

4.1. New compulsory financial statements submission forms

The convergence of the IFRSs and US GAAPs accounting standards allows a uniformity in the presentation of the financial statements in every part of the world. The business strongly requires that information to be relevant, reliable, comparable and timely. These essentials appear even more evident if we

take into account the increasing complexity and details required by the accounting principles themselves. Implementation of accounting principles and of knowledge management to perform it, is changing the accounting practices. In the twentieth century the accountants' salary was considered as the main cost of an accounting department. Accountants had to spend a lot of time entering an ever-increasing amount of data in the accounting books (journal and ledger), initially papery, then computerized, since the 90s.

Since the end of the 1990s, accounting information systems (Amat, Amat, 2019) are becoming increasingly used in accounting departments, favoring time-loss in data entry, reducing errors, improving the statement processing time (almost immediate) and procedures (adjusting entries), allowing an integration with cost accounting (Astuty, 2019), and thus, obtaining a high degree of detail (previously unthinkable). The skills requirements in accounting departments are rapidly changing, moving towards information technology rather than accounting. However, the costs of keeping the accounts have not decreased. New costs occurs: accounting software licenses (in particular ERP software), which have become essential, and it is increasing exponentially. In the present time, the number of accountants is being reduced, companies are looking now for fewer but more qualified employees (Richards et al., 2019). Accountants must be able to use accounting information systems perfectly and must also be able to customize them. IT knowledge is therefore now undoubtedly essential. Knowledge management (O'Leary, 2018) in accounting departments is increasingly oriented towards the integration of IT systems with financial, accounting and legal skills. The main challenge is to create teams of people able to understand and apply transversal knowledge, capable to reason in terms of flow chart, in order to communicate with a single common denominator and expressing each other's work needs. The positive combination between IT and accounting is allowing an increasingly timely and reliable disclosure, which is leading to a uniformity of exposure. It is better that, standard setters, tax authorities and legislators should constantly interact with the software houses. This will the coordination between practice and laws, to face accounting systems challenging. Financial statements represent a crucial disclosure of the synthesis, not only among accounting, legal and fiscal rules, but also among these rules and the constraints and opportunities of information technology. This challenge is faced not only by standard setters, tax authorities and legislators, but also by accounting practitioners, developers of business reporting, IT professionals, auditors, executives, bureaucrats, academics, students, politicians and government ministers.

The information summarized by the financial statement (as this is a document on which all stakeholders rely), is better to be collected, synthesized, transmitted and analyzed with incredible rapidity and accuracy (Ramin, Reiman, 2013). Since XBRL is a language that can be used by companies to fulfill legal and accounting obligations, this is an open source technology that contains standard tags, but it allows the tracking of objects in order to perform different types of analysis.

XBRL is not a software itself, it is a standardized language program, usable by software houses to create and customize specific software for its customers. In general, free user-friendly versions are also available and provided by governments, to allow all companies, in any case, to prepare and send financial statements. Even if there is a need and a tendency towards uniformity, in particular to comply with the requirements of the most widespread international accounting standards, IFRS and US GAAP, there are various XBRL taxonomies, which are constantly updated and released on an annual basis. Each country is better to try to customize taxonomies to take into consideration the translation in different languages. Initially the XBRL taxonomy included only the numerical schemes of the financial statement: statement of financial position (*balance sheet*), statement of comprehensive income (*income statement or profit and loss statement*), statement of cash flows (*funds flow statement*),

and statement of changes in equity. Furthermore, XBRL language now also concerns the descriptive notes of the financial statements, limiting the freedom of company directors in drafting this annex. However, the taxonomy as regards the notes of the financial statement, provides a rigidity only in relation to the list of paragraphs to be included. The editor of the financial statement is then free to add comments, to include further detail in each paragraphs or to specify within the mandatory paragraphs that some paragraphs are not inherent and should not be drafted. The accounting and financial systems are continuously updated. Here is how, in 2019 there is another update in the US GAAP Financial Reporting Taxonomy. This one contains mainly updates for accounting standards. It includes amendments for the SEC's authoritative literature in which the underlying recognition and measurement are not specified by GAAP, but implemented by XBRL codification anyway (https://xbrl.us/home/filers/sec-reporting/taxonomies/). The latest update for IFRS (International Financial Reporting Standards) Taxonomy it was in 2018. It was required to markup electronic IFRS financial statements. By providing the IFRS Taxonomy, the International Accounting Standards Board can ensure that the taxonomy used is an accurate representation of International Financial Reporting Standards (IFRS Standards) (https://xbrl.us/home/filers/sec-reporting/taxonomies/).

4.2. Impact of XBRL on financial analysis and audit effectiveness

XBRL is a technology that allows object tracking. It is based on XML (Extensible Markup Language), that is a metalanguage, or a marker language based on a syntactic mechanism that allows to define and control the meaning of the elements contained in a document or in a text. The World Wide Web Consortium (W3C) (Clark, deRose, 2017; Cole et al., 2016), following the browser war (the situation occurred in the nineties in which Microsoft and Netscape introduced, with each new version of their browser, an extension that is proprietary to the official HTML), was forced to follow the individual extensions to the HTML language. The W3C had to choose which features to standardize and which to leave out of official HTML specifications. It was in this context that the need for a markup language that gave more freedom in tagging, while remaining in a standard, began to emerge. The "XML project", which began at the end of the nineties in the SGML Activity of W3C, aroused so much interest that W3C created a working group, called the XML Working Group, composed of world experts in SGML technologies, and a commission, the XML Editorial Review Board, responsible for drafting the project specifications. In February 1998, the specifications became an official recommendation with the name of Extensible Mark-up Language, version 1.0. Soon we realized that XML was not limited to the web context but it was something more: an instrument that allowed to be used in the most diverse contexts, from the definition of the document structure, to the exchange of information between different systems, from the representation of images to the definition of data formats. Compared to HTML, XML has a very different purpose: while the former defines a grammar for the description and formatting of web pages (layouts) and, in general, hypertexts, the second is a metalanguage used to create new languages, suitable for describing structured documents. While HTML has a well-defined and restricted set of tags, with XML it is instead possible to define its own according to the needs. XML is nowadays also widely used as a means of exporting data between different DBMSs (Database Management Systems). The use in the configuration files of applications and operating systems is widespread. XML, like HTML, uses markers in its programming. These markers are called tags (labels), to assign a semantics to the text. Tags can contain information in two ways: through parameters or by enclosing text or other types of information. It follows that they can be opening tags, necessarily followed by closing tags (among which you can

have a content) or tags that open and close, and can therefore provide information only through their parameters. Each label starts and ends with angle brackets <> (which in other contexts would be the minor and major signs), while the closing of the tag or the closing tag is represented by the / bar. The advantages of XML can be summarized in one word: SPEED. Speed is above all the main reason that drives many companies to switch to e-commerce: faster response to customer needs, faster publishing of direct information to customers and supply chain partners; faster processing of orders received via the Internet. SPEED is also an acronym that lists the main advantages of XML: Storing, Publishing and Exchanging Electronic Documents. XBRL, in particular, is the language based on XML programming used for communication and the exchange of financial and accounting data in electronic format (Radu, 2016; Santos, et al., 2016; Wang, Wang, 2018; Blankespoor, 2019).

The legislation on auditing and the auditing standards do not provide for the auditor new controls with reference to the codification of the financial statements compliant with XBRL format. Therefore, the auditor must not carry out specific checks on the XBRL format and on submitting the financial statements in the XBRL format.

In this regard, it is worth pointing out by the Auditing and Assurance Standards Board (IASSB – an international body responsible for ruling the principles and rules of the revision), in the document entitled *IAASB Staff questions and answers – XBRL: The emerging landscape* (IAASB, 2010), that the auditor is not required to implement verification procedures on the conversion of the financial statements in XBRL format. A role cannot be assigned to the auditor with reference to the new discipline concerning the XBRL format also in consideration of the fact that the XBRL format is not included in the other information required by the auditor according to the ISA 720 international audit principle. Therefore, the auditor is not required to assess any inconsistencies between the financial statements on which he has made a judgment and the one submitted in the XBRL format. The foregoing does not exclude, however, that the company may instruct the auditor to perform these audits, but the same would not be included in the task of revision. It would be just the subject of a separate remark. In this case, the engagement letter and the letter of attestation should explicitly contain the identification of this additional task compared to the ordinary audit (Abdolmohammadi et al., 2017; Hoitash, Hoitash, 2017; Mao, Zhang, 2017).

Since it is a standardized language, XBRL provides a efficient and consistent system to define the data model of an application for analyzing financial documents. This is useful for the application of standard methodologies, such as: historical analysis of financial statements through the reclassification of the statements and the analysis of the financial statement indices; and, prospective analysis through the preparation of pro-forma financial statements.

A compliant with the specifications XBRL taxonomy provides an effective environment for defining: the data dictionary of the elements used by financial models as input variables, and the layout and logic of calculation of the reclassified statements. XBRL can be used as an input data format, which feeds analysis modules, or as an output format, which allows the export of data processed by the model. For example, we can export a forecast income statement to accounting software that has additional modules for planning and budgets, or produce a financial statement to be published on a web portal for reporting to senior management. The extensibility of XBRL data models, both in taxonomies and in instances, offers very powerful functionalities in this context (Erzegovesi, Bonetti, 2007).

4.3. Blockchain and accounting bookkeeping

The distinctiveness of the Blockchain consists in the absence of an intermediary entity that must guarantee the truthfulness of the data. This task, in fact, is performed by participants themselves to the Blockchain, through an authentication system. In addition, every transaction stored in the chain cannot be deleted or modified, and can be consulted at any time by members of the network. The transactions to which Blockchain technology can be applied are, ideally, all those involving the following subjects: payments, management of information linked to contracts (such as smart contracts), and transactions involving the exchange of goods and services and many others. All the business sectors may be potentially affected (from banking to insurance, from energy to healthcare, without excluding the telecommunications one). The Blockchain phenomenon, although it arouses a certain enthusiasm thanks to the multiple benefits it brings to both individuals and businesses, is not exempt from arousing even some concerns. However, it is expected that it will allow a safer and faster transmission flow of data and information, while the creation of databases with the same characteristics of the ledgers, it will allow a simplification and speeding up of the necessary processes, for example, for the assessment and the payment of taxes. Its main characteristic, the decentralization, allows the execution of processes in the absence of a certification intermediary, putting at risk the existence of all those professions such as notaries, lawyers, auditors and accountants, who have always dealt, at different levels, with certify data and information. The spread and impact of blockchain are growing together with the increase in the volume of data produced every day. However, according to Gartner and Deloitte (well-known research and advisory companies) (Furlonger , 2017; Rithu, Preetha 2018), it will be necessary to wait until at least till 2025 to witness the emergence of its most disruptive and highly transformative effects. At the moment, we find ourselves in what has been identified as the first phase of experimentation and use of technology.

The main application of the Distributed Ledger (Yu et al., 2018; Shyshkova, 2018), above all by leveraging the peculiarities of smart contracts, is the reconciliation of the administrative documents of the companies in a decentralized manner, thus delegating this activity to the decentralized consent of the Blockchain. Essentially three-way reconciliation (like a reconciliation that involves three documents such as orders, transport documents, and invoices), as well as two-way reconciliations (like a reconciliation that involves two documents such as orders and invoices), could be performed inside the Blockchain. Therefore, it would no longer be necessary to issue the documents (they are already produced in the system and therefore accessible by the parties), to store them (because already stored in the system), and to show them (they are accessible by anyone authorized and therefore distributable). Since the Blockchain technology can be also be applied to electronic invoicing, it has the potential to transform the process of validation of transactions, and the way invoices issued and payments are made. Combining decentralization and electronic bills, the system will benefit from a tamper-proof and transparent structure, also minimizing the risk of human error and frauds (Fischer, 2018; Hambiralovic, and Karlsson, 2018). Each record or block, linked and secured using cryptography, is also visible to all parties, therefore removing the need for an intermediary (Dwyer, 2017; Hays, 2018; Mishra, 2018).

4.4. Benefits of artificial intelligence in applying knowledge management on XBRL and Blockchain for business accuracy

It is evident and inevitable that the future of accounting practices will be characterized, developed and determined by the combination of XBRL language, artificial intelligence, Blockchain technology as an expression of the triple entry bookkeeping system and electronic invoicing. Knowledge management related to accounting reflects the needs of the historical context, but above all, through the use of new technologies and the intellectual combination of information

technology and accounting, it manages to solve long-standing challenges. Some problems, such as the reliability of the information indicated and the lack of cross-comparison, have always existed, others have arisen recently, such as those related to globalization, the need for standardization, comparability, rapidity of registration (due to the immense amount of data to be recorded) and, last but not least, the big data analysis.

The convergence towards the integrated use of new digital technologies is now an inescapable process. There are too many advantages and opportunities arising from the integrated use of all these advanced tools. The challenges that accounting is facing in the contemporary world are mainly determined by globalization, which exponentially increases competitiveness in every sector, and the lack of trust, due to the depersonalization of every relationship.
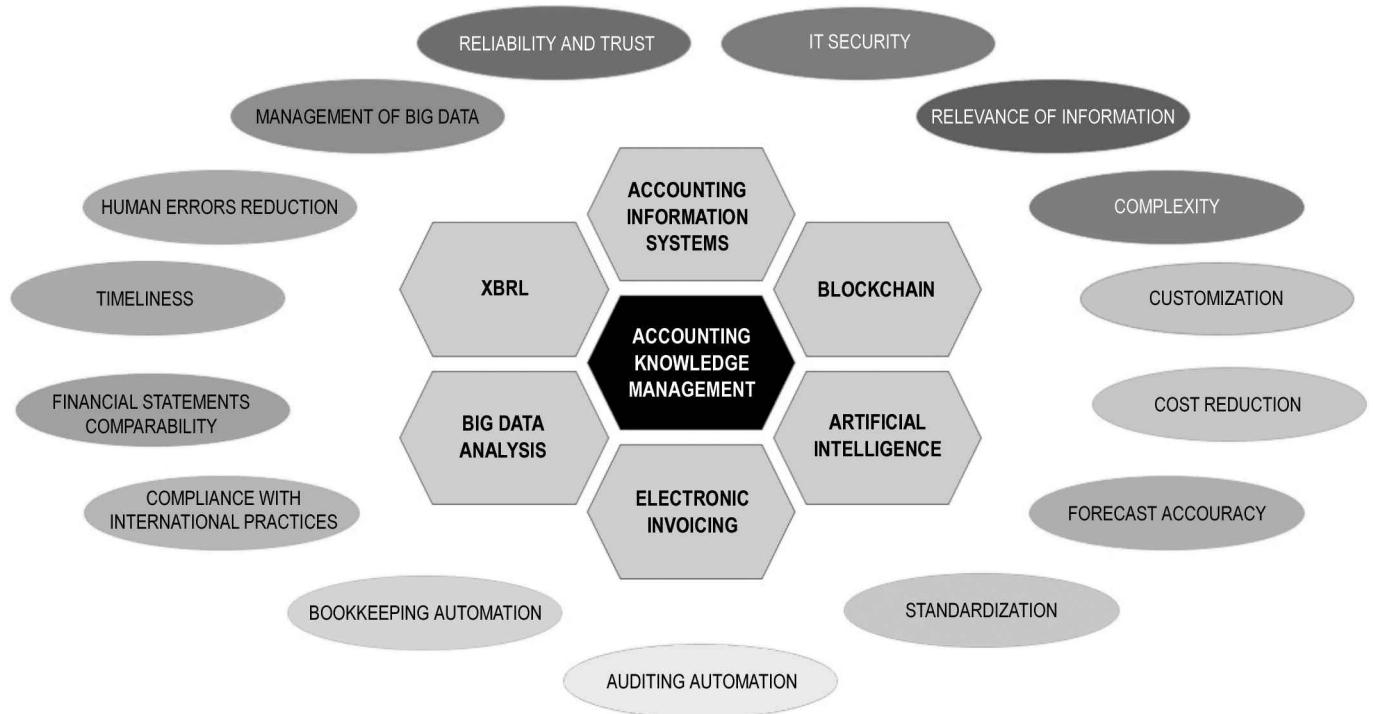

Figure 1. Digital Future of Accounting Knowledge Management

The Figure 1 displays a comprehensive representation of all the challenges that accounting knowledge management is facing in the digital era. As can be easily observed, reasoning on the opportunities and advantages offered by each technology, each tool, integrated with the others, will provide a complete shield against all these problems, providing an immediate and effective solution.

Positive answers to challenges are often found through the combination of different technologies (for example, the reduction of human error can occur with the use, at the same time, of electronic invoicing, Accounting Information Systems (Zaki et al., 2019), Artificial Intelligence, and Blockchain), in other cases a single digital tool can solve problems that afflicted the accounting system since its creation (for example, the Blockchain solves the problem of reliability and trust as an expression of the triple entry bookkeeping system).

4.5. Necessity of new approach of Management and Supervision of Financial Institutions and Services

The global financial and economic crisis has done a lot of harm to public trust and confidence in governing and financial institutions, as well as the principles and the concept itself of the market economy. It has also eroded a lot of public trust in corporations. The climate of global financial uneasiness can partly be attributed to the global meltdown of 2008 where governments and other regulatory agents failed in their responsibility to monitor and steer unrestrained speculative and damaging financial activities (Scardovi, 2017). Financial crises often lead to the emergence of new national and international institutions. Financial digitalization lead to new responsibilities of financial supervisor. The recent global financial crisis has provided a unique opportunity to go beyond economic data and to

capture cross border financial data and other information that could assist international and national institutions (Moshirian, 2011), to measure and manage financial risk more effectively, and to prepare for challenges raised by *new financial technologies*. Only an internationally integrated financial system will make large banks global.

FinTech has revolutionized the entire financial services industry by using innovative and advanced technologies such as Blockchain, cryptocurrencies, XBRL, Artificial Intelligence and robot-advisors. These innovative financial technologies come to realign and reboost the efficiency and quality of financial services by cutting the human errors and time processing.

Central banks are the lead authority for macro prudential policy in most jurisdictions. Macro prudential responsibilities are more likely to be given to the central bank when the central bank is also the micro prudential supervisor for banking and financial institutions. Dedicated committees are also responsible for macro prudential policy in a number of jurisdictions and typically include government representatives, central bankers and supervisory officials. More generally, most jurisdictions have strengthened their frameworks for monitoring financial stability (Calvo et al., 2018), typically by setting up public authorities.

The involvement of central banks is a key feature of any financial supervisory architecture. This is also a source of synergies and conflicts of interest. Synergies stem from the links between financial and economic stability and from the connection between monitoring the overall liquidity of the system – the role of central banks – and the oversight of financial system solvency, which is the role of the prudential supervisory function. On the other hand, conflicts of interest may emerge as monetary policy decisions concerning the setting of interest rates can affect banks' profitability and solvency. The assignment of prudential responsibilities to the central bank also raises concerns of a political economy nature including reputational risk and

excessive concentration of authority. In the United States, different functions are typically assigned to several agencies at the federal or state level. In the European Union, member states and those on the accession process share a single prudential supervisory authority (the European Central Bank's Single Supervisory Mechanism) for significant banks (Calvo et al., 2018). However, Member States do keep responsibility for the prudential oversight of smaller institutions and for other supervisory functions, through their central banks or dedicated supervision public authorities (for other institutions than bank, such: insurance companies and private pension funds). Currently there are 268 financial supervisors (around the world).

References

[1] Abdolmohammadi, M.J., DeSimone, S.M., Hsieh, T.S., and Wang, Z. (2017). Factors associated with internal audit function involvement with XBRL implementation in public companies: An international study. *International Journal of Accounting Information Systems*, 25, 45-56.

[2] Amat, O. and Amat, N. (2019). Evolution of financial information and management control over the last 150 years. The case of Bodegas Torres. *Economics Working Paper Series*. Working Paper No.1633. Retrieved from:
https://econ-papers.upf.edu/papers/1633.pdf

[3] Astuty, W. (2019). An Analysis of the Effects on Application of Management Accounting Information Systems and Quality Management Accounting Information. *Kumpulan Jurnal Dosen Universitas Muhammadiyah Sumatera Utara*, Vol. 7, No. 3.

[4] Blankespoor, E. (2019). The impact of information processing costs on firm disclosure choice: Evidence from the XBRL mandate. *Journal of Accounting Research*, Forthcoming.

[5] Calvo, D., Crisanto, J.C., Hohl, S, and Gutierrez, O.P. (2018). Financial Supervisory architecture: what was changed after the crisis? *FSI Insights on policy implementation. Financial Stability Institute Papers* No. 8. Retrieved from:
https://www.bis.org/fsi/publ/insights8.pdf

[6] Clark, J., and DeRose, S. (2017). XML path language (XPath) version 1.0. W3C recommendation, 1999. World Wide Web Consortium. Retrieved from http://w3c. org/TR/xpath.

[7] Cole, E.T., and Goessel, R.E. (2016). Hands on XBRL and Industry Analysis. *International Journal of Business and Applied Social Science*, 2(5), 21-33.

[8] Dwyer, G.P. (2017). The Most Important Concepts in Finance, Edward Elgar Publishing. Chapter: Blockchain: a primer. pp.12-27.

[9] Economic Corporate Network (2016). *The Future of Digital Finance*. Retrieved from:
https://www.corporatenetwork.com/media/1617/the-future-of-digital-finance_web.pdf

[10] Erzegovesi, L., and Bonetti, E. (2007). Utilizzo di XBRL e Quantrix Modeler nelle analisi di bilancio – Parte 1. *XBRL e Quantrix Modeler*. Retrieved from:
https://www.researchgate.net/publication/237625808_Utilizzo_di_XBRL_e_Quantrix_Modeler_nelle_analisi_di_bilancio_-_Parte_1

[11] Faccia, A., and Moşteanu, N.R. (2019). Accounting and Blockchain technology from double-entry to triple-entry. Published in Proceedings of *8th International Conference on Business and Economic Development (ICBED)*, 8-9 April, 2019, New York, USA. http://www.abrmr.com/myfile/home/home_firstpdf/con_fst_78625.pdf

[12] Fischer, D. (2018). Ethical and Professional Implications of Blockchain Accounting Ledgers. *SSRN Electronic Journal*. Retrieved from:
https://www.researchgate.net/publication/331333009_Ethical_and_Professional_Implications_of_Blockchain_Accounting_Ledgers

[13] Furlonger D. (2017). Practical Blockchain: A Gartner Trend Insight Report. *Gartner research*.

[14] Greenbaum, S.I., Thakor, A.V., and Boot, A. (2016). Contemporary financial intermediation. *Academic Press*. Chapter 3.

[15] Hambiralovic, M., and Karlsson, R. (2018). Blockchain Accounting in a Tripple-Entry System. *Lund University _ School of Economics and Management Papers*. Retrieved from:
http://lup.lub.lu.se/luur/download?func=downloadFile&recordOId=8953732&fileOId=8953736

[16] Hays, D. (2018). Blockchain: an overview. *LSE Business Review*. Retrieved from:https://blogs.lse.ac.uk/businessreview/2018/02/22/blockchain-an-overview/

[17] He, D., Habermeier, K.F., Leckow, R.B., Haksar, V., Almeid, Y., Kashima, M., and Kyriakos-Saad, N. (2016). Virtual Currencies and Beyond: Initial Considerations. *IMF Staff Discussion Note*. Retrieved from:
http://www.imf.org/external/pubs/cat/longres.aspx?sk=43618

[18] Hoitash, R., and Hoitash, U. (2017). Measuring accounting reporting complexity with XBRL. *The Accounting Review*, 93(1), 259-287.

[19] Hoffman, C., and Strand, C. (2001). XBRL Essentials. New York: *American Institute of Certified Public Accountants (AICPA)*.

[20] IAASB (2010). Staff questions and answers - XBRL: The emerging landscape.

[21] Kloeden, P. (2006). XBRL: Origins, implementation and acceptance. *Rochester Institute of Technology. RIT Scholar Works.* Retrieved from:
https://scholarworks.rit.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=2628&context=article.

[22] Koistinen, A.K. (2016). The (care) robot in science fiction: A monster or a tool for the future?. *Confero*, 4.

[23] Lokova, M.Y., Khanova, M.N., Azamatova, G.K., Vindizheva, A.O., and Reshetnikova, N.N. (2018). Social Consequences of the Impact of Information Technologies on the Values of Modern Youth in the Conditions of the Global Financial and Economic Crisis. In International Conference Project "*The future of the Global Financial System: Downfall of Harmony*" (pp. 176-182). Springer, Cham.

[24] Mao, Y., and Zhang, L. (2017). The influence of XBRL to audit and countermeasure research. Proceedings of *3rd International Conference on Economics, Social Science, Arts, Education and Management Engineering (ESSAEME 2017)*. Atlantis Press, https://doi.org/10.2991/essaeme-17.2017.454

[25] Mishra, R. K. (2018). Blockchain Technology-an Exploratory Study on its Applications. *SSRN Electronic Journal*. Retrieved from:
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3194522

[26] Mohamed, H., Ali, H. (2019). Blockchain, Fintech and Islamic Finance. *CPI books GmbH*, Leck.

[27] Moshirian, F. (2011). The global financial crisis and the evolution of markets, institutions and regulation. *Journal of Banking and Finance*, 35(3), 502-511.

[28] Moşteanu, N.R. and AlGhaddaf, C. (2019). Smart economic development by Using Foreign Direct Investments – UAE case study. *Journal of Information Systems and Operations*, Vol.13, No.1.

[29] Moşteanu, N.R. (2019). Regional development and Economic Growth approach in Europe and GCC. *Ecoforum Journal*, Vol.8, No. 2.

[30] Nakamoto, S. (2008). *Bitcoin: A peer-to-peer electronic cash system*. Retrieved from:
https://s3.amazonaws.com/academia.edu.documents/54517945/Bitcoin_paper_Original_2.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1555316290&Signature=JrYpvPU33vM8Qaxm49xINvKKdCQ%3D&response-content-disposition=inline%3B%20filename%3DBitcoin_A_Peer-to-Peer_Electronic_Cash_S.pdf

[31] Nitchman, D. (2016). XBRL around the World. *Journal of Accountancy*, 206(4), p.62. Retrieved from:
https://www.xbrl.org/xbrl-around-the-world/

[32] O'Leary, D.E. (2018). Big Data and Knowledge Management with Applications in *Accounting and Auditing*: The Case of Watson. *SSRN Electronic Journal*. Retrieved from:
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3203842

[33] Radu, F. (2016). XBRL–The business Language in the Digital Age. *Ovidius University Annals, Economic Sciences Series*, 16(2), 589-594.

[34] Ramin K., Reiman C. (2013). IFRS and XBRL. How to improve Business reporting through technology and Object Tracking. *Wiley Corporate* F&A.

[35] Richards, R., Stevens, R., Silver, L., and Metts, S. (2019). Overcoming employer perceptions of online accounting education with knowledge. *Administrative Issues Journal: Connecting Education, Practice, and Research*, 8(2), 70-80.

[36] Rithu T., Preetha D., (2018). Blockchain, a technical primer. *Deloitte Insight Paper*.

[37] Santos, I., Castro, E., and Velasco, M. (2016). XBRL formula specification in the multidimensional data model. *Information Systems*, 57, 20-37.

[38] Scardovi, C. (2017). Digital Transformation in Financial Services. *Springer International Publishing*. Retrieved from: //www.springer.com/gp/book/9783319669441

[39] Schueffel, P. (2016). Taming the Beast: A Scientific Definition of FinTech. *Journal of Innovation Management*, 4(4), 32-54.

[40] Schultebraucks, L. (2018). A short history of Artificial Intelligence. Retrieved from https://dev.to/lschultebraucks/a-short-history-of-artificial-intelligence-7hm.

[41] Shyshkova, N. (2018). Prospects for the Implementation of Blockchain in Accounting. *Accounting and Finance*, (2), 61-68.

[42] Solis, B., Littleton, A. (2017). The 2017 State of Digital Transformation. Research Report. *Altimeter Group*. Retrieved from: https://www.prophet.com/wp-content/uploads/2018/04/Altimeter-_-2017-State-of-DT.pdf

[43] Tie, R. (2005). XBRL: It's Unstoppable. *Journal of Accountancy*, 200(2), 32.

[44] Turing, A., (1950). Computing machinery and intelligence. *Mind*, 59(236):435–460.

[45] Wang, B., and Wang, D. (2018). A Process Model for XBRL Taxonomy Development. *Journal of Signal Processing Systems*, 90(8-9), 1213-1220.

[46] Zaki M., Khayyam H., Erfan N., Abdelmounaam R. (2019). Wisdom extraction in knowledge-based information systems, *Journal of Knowledge Management*, 23(1), pp.23-45.

[47] Zhao, H. (2018). Assessing the Economic Impact of Artificial Intelligence. *ITU Trends. Emerging Trends in ICTs*. Issue no.1, September 2018.

[48] Yu, T., Lin, S., and Tang, Q. (2018). Blockchain: Introduction and Application in Financial Accounting. *SSRN Electronic Journal*. Retrieved from: https://www.researchgate.net/publication/329133452_Blockchain_Introduction_and_Application_in_Financial_Accounting

[49] Yuji, I. (1982). Triple-Entry Bookkeeping and Income Momentum, *American Accounting Association*.

[50] Yuji I. (1986). A framework for triple-entry bookkeeping. *The Accounting Review*. Vol. 61, No. 4 (Oct., 1986), pp. 745-759