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An Exploratory Corpus-Based Linguistic Analysis of 'Bitcoin' in Online Articles

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This study explores the unique linguistic characteristics of bitcoin, which has significantly changed the financial world over the past few years. As the concept of bitcoin, cryptocurrency and the digital network behind them are not dealt with in LSP (Language for Specific Purposes) coursebooks yet, this small-scale research is intended to fill this niche. In order to see what terminology has to be acquired to be able to understand the basic issues about bitcoin, online sources dealing with this innovative technology and its regulatory systems have been used. The selected online texts are analysed by TextStat software, which is capable of making word counts and collocation frequency. The results show us the most common collocations with bitcoin, and blockchain processing within context, as well as the most frequently used words (e.g., cryptocurrency or exchange), which definitely need to be learned by students majoring in Business English. My aim with this research is that LSP teachers get a comprehensive picture of what terminology to teach to their student when dealing with the topic of cryptocurrencies. In addition, bitcoin-related vocabulary can be integrated into other subjects, such as economics, finance or technology, allowing students to explore the connections between different fields of knowledge.

Keywords: Bitcoin, cryptocurrency, blockchain, collocation, online

INTRODUCTION

When people hear the word 'bitcoin' or digital currency, they may have quite mixed feelings about it. Some might become rather concerned about it, others may think just the opposite, and see it as an easy and novel method of payment. Bitcoin is defined by Investopedia as "a cryptocurrency, a virtual currency designed to act as money and a form of payment outside the control of any one person, group, or entity, and thus removing the need for third-party involvement in financial transactions". One thing is sure that bitcoin has changed our lives in a similar way that the Internet has done over the last few decades. It was created by developer Satoshi Nakamoto (2008) who saw certain problems with existing payment systems during the financial crisis in 2008 and wanted to address them by introducing an online version of cash to buy products and services. Its

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popularity grew in no time as the owner of bitcoin does not need to pay transaction fee and can protect his privacy by hiding behind a bitcoin wallet address.

This anonymity has allowed the black market to flourish and made illegal transactions difficult to track (Heilman, 2016). Up till now research on bitcoin has mainly focused on areas, such as scalability issues, off-chain transactions, as well as security and privacy issues like the potential risks and threats in bitcoin transactions, or how its adoption and integration of into the global economy might affect monetary policy and financial ability. But to my knowledge, it has never been researched from a linguistic point of view.

Even though nearly 15 years have passed since the appearance of the first cryptocurrencies, the LSP coursebooks still do not deal with this new technology. Therefore, the goal of this study is to explore the linguistic context of bitcoin, which can serve as the basis for sound course and materials design for Business English courses, as well as to give on overview of the regulatory systems of bitcoin worldwide.

In order to gain a comprehensive picture of the most common collocations with bitcoin, the approach and methods of corpus linguistics have been found appropriate, which allows the analysis of a large number of texts.

Literature Review

Bitcoin has been studied from a number of perspectives, such as an Information Systems (IS) like cyber threat intelligence (Yin et al. 2019), its trust and enforcement in banking (Cristopher, 2016) or its policy considerations for public and private applications (2016) but to my knowledge, no linguistic research has been conducted on its linguistic characteristics. Researchers since the late 1990s have emphasized the specificity of language and content of ESP classes (e.g., Dudley-Evans & St John, 1998; Hyland, 2002, 2008). Special disciplines (contents) need special language, which is then designed to meet specific needs of the learner.

It is a generally accepted view among ESP (English for Specific Purposes) educators that language and subject-learning objectives can be integrated through Language Integrated Learning (CLIL) (Stoller, 2004), which enhances the learners' language proficiency and their professional knowledge in a specific field. Therefore, the lexical level, how the words keep together (Firth, 1968) and their combination, are an important aspect of language description (Sager et al., 1980). Cowie (1992), for instance, claimed that collocations as ready-made complex units had a significant role in newspaper articles. These word combinations have been studied by a number of researchers under different terms like fixed expressions (Moon, 1998, 2000), lexical phrases (Nattinger & DeCarrico, 1992), pre-fabs, ready-made units (Cowie, 1992). This lexically-oriented approach is the starting point for the present research.

Corpus linguistics

With advances in computer technology and the growing recognition of the importance of authentic text analysis in ESP classes, more and more facilities were developed to make use of corpora which can be representative of a given text type and can investigate a particular type of language (Sinclaire, 1991, Thompson, 2001, Hunston, 2002). Corpus

research has gained importance in ESP (English for Specific Purposes) since the 1990s (e.g., Sznajder, 2010; Walker, 2011; Lelakova &Toman, 2023), which aimed to focus on real language use. Based on a corpus research, Willis (1990) suggested that learners should be provided with a corpus containing the most frequently occurring words with their commonest patterns, phrases, clauses in authentic texts. In the field of learning and teaching, the corpus techniques are especially helpful for both learners and teachers (Huang, 2011; Lelakova & Toman, 2023), therefore, this approach has been adopted in this study.

Lexis-oriented approach

Focus on lexis and relevant topics of a given discipline is essential in ESP context. Therefore, lexis-oriented approach is often applied in ESP (Sinclair, 1987; Sinclair & Renouf, 1988), which provides learners with a corpus containing the most frequently occurring words with their commonest patterns in authentic texts. Lewis (1993, p. 109), however, criticized this method by saying that the most frequent words are usually function words with low semantic content, e.g., to, with or have. He adds that the lexical analysis concentrates on the word as opposed to meaning and it can happen that rare meanings of frequent words are given priority over frequent meaning of less frequent words. Nation (1990) groups lexis into three main categories: technical, semi-technical and general lexis. He claims that technical lexis is subject-related (e.g., dividend), therefore, technical terms occur with a much greater frequency in specialized texts. Semi-technical lexis is somewhere between specialised and general items, neither highly technical nor general being everyday words (e.g., factor). The distinction between technical and semi-technical words in the analysis is decided by the researcher and her peer instructor in the study.

Although the concept of collocation is widely used in corpus linguistics and in language teaching, clear-cut definition is not yet available. The textual definition is illustrated by Sinclaire (1991) who claims that “Collocation is the occurrence of two or more words within a short space of each other in a text” (p. 170). According to this definition. a lexical item collocates with another if it occurs within a certain collocational span; however, there is no agreement in the literature about the size of an appropriate span. Most studies apply a span between 2 to 5 words from the word under scrutiny (Stubbs, 1995; Sinclaire, 1991). Computerized corpora can facilitate large scale lexical analysis, which can identify that certain words and phrases tend to occur more frequently in a semantic environment.

Bitcoin regulations worldwide

Bitcoin as a fairly new technological development, is a topic which is of great interest worldwide. Bitcoin's history as a store of value has been turbulent and it has gone through several boom-and-bust cycles over its relatively short lifespan. In 2022 a compendium on cryptocurrency regulation by country (see web reference) was published in which regulators argue that the lack of standardized definitions creates questions of overlap and jurisdiction and express the need for international coordination and engagement with the industry. The way how bitcoins are regulated by national

governments varies greatly from country to country. Overall, we can say that two methods are used: one uses financial market regulators (e.g., Canada, Singapore, Switzerland, the UK and the US), while the other merely warns cryptocurrency users of possible dangers and losses (e.g., Hungary), therefore, they do not take the responsibility for the losses. Interestingly enough, in the UK only proposals for crypto usage exist, and laws are only expected soon. In Hungary, for instance, lawmakers have considered reducing taxes on cryptocurrency trading to 15% of income, down from the current rate of 30.5% due to COVID pandemic.

METHOD

The present study uses corpus linguistic analysis approach to extract meaningful insights about language usage and patterns in online texts on bitcoin regulation. The corpus is built on the basis of the following research questions:

Q1: What lexical items are typically associated with the word 'bitcoin' in the online articles?

Q2: What collocational patterns emerge in the selected articles?

Q3: What pedagogical implications do the findings have for teaching English for Special Purposes with an emphasis on course design and materials development?

The selected texts come from business online sources which provide an opportunity to explore lexical patterns to study vocabulary and meanings in professional context.

By utilizing the TextStat software tool, the frequency of bitcoin related words and collocations are examined, which are then transferred into excel sheets to customize the appearance of the data.

The qualitative text analysis of collocations aims to understand how words tend to co-occur with each other and the underlying reasons for these associations.

Mixed research method

This small-scale research combines both qualitative and quantitative approaches arguing that a careful mix of automated language analysis and manual text analysis can help gain a comprehensive understanding of the bitcoin language use (Crosthwaite, 2023).

The issue of the corpus size has been a heavily debated question among corpus linguists, however, the main guiding principle of "bigger means better" (Leech, 1991, p. 9) seems to be being abandoned, and smaller corpora are also being compiled, especially, for specific purposes. Biber et al. (1998, p. 250) argue that every corpus has limitations, but a well-designed corpus will still be useful for investigating a variety of linguistic issues. The corpus used for the present linguistic analysis is relatively small but it makes it possible to make some general statements as a whole about the use of 'bitcoin' in the business newspaper articles. With the help of specially designed software TextStat, words and collocations of the corpus are viewed in context.

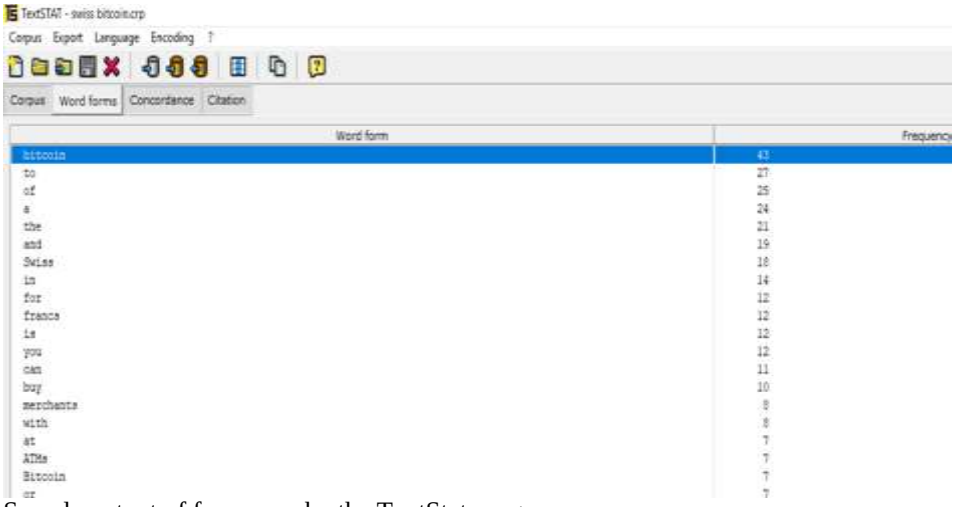
In order to capture language in use, all texts in the corpus are taken from genuine sources. The text selection criteria for the corpus were as follows: (1) the texts should be publicly available (i.e., internet sites); (2) they should deal with the bitcoin/cryptocurrency regulations in different countries; and (3) the texts should be issued after 2019 so that we could have as up-to-date information as possible. The selected texts come from journals, like Hungary Today and Budapest Business Journal; websites, like moneyland.ch, Investopedia.com, buybitcoinworldwide.com, CMB (Crawley MacKewn Brush) and coinpedia.org. They deal with the crypto regulations in 6 countries: Canada, Hungary, Singapore, Switzerland, the UK and the US. Two articles per country have been selected for the analysis to discover the prevalent language use.

Instrument

Since the aim of this small-scale research is to look for lexical items associated with the word bitcoin, first TextStat, a text analysis software tool is used to generate word frequency lists, concordances and collocation data. The reason why TextStat was used is that it is user friendly, it provides simple internet functionality and is free. The application recognizes and accepts URLtexts or txt formats and makes text statistics, counts characters, words, sentences, to find words repetitions and how many times they appear in a given text. In both cases, it is essential that the file to be added consist of plain text without any formatting. The program counts the frequency of occurrence of individual word types and concordances.

Having determined the most frequent lexical items and collocations, the extracted collocations are grouped based on semantic categories and domain-specific contexts manually to determine their prevalence and popularity. Based on the findings, a qualitative interpretation is provided where the underlying patterns are identified.

Table 1 shows the output of the TextStat program for an example of word frequency from the Swiss regulation corpus. As can be seen in Figure 1, the lexical item bitcoin appears 43 times in the article on Swiss bitcoin regulations.



Sample output of frequency by the TextStat program

By clicking on the bitcoin line, all the collocations of bitcoin are displayed (see Figure 2), e.g., *buying bitcoin, purchase bitcoin, bitcoin savings account,* etc.

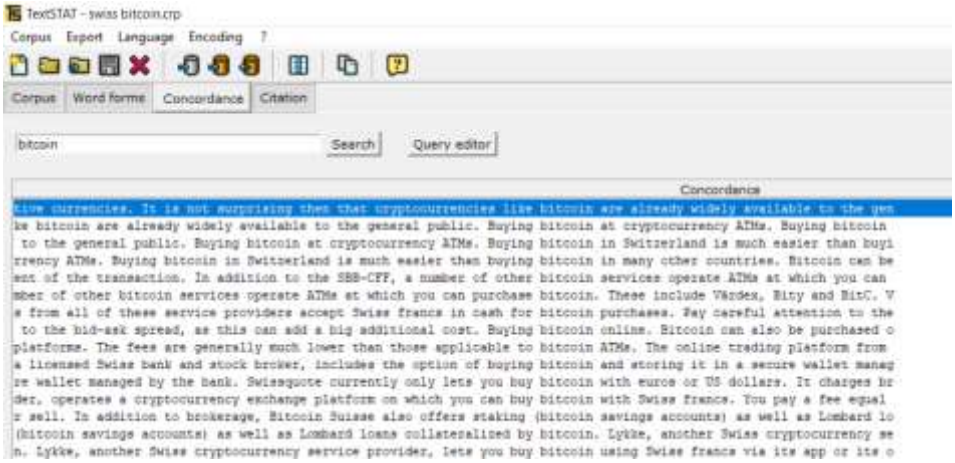


Figure 2
Sample output of concordances by the TextStat program

The reason why collocations play an important role in language teaching/learning is that a collocation is part of a native speaker's communicative competence and presents "the relationship a lexical item has with items that appear with greater than random probability in its textual context" (Hoey, 1991, pp. 6-7). The strength of collocations can be measured by statistical methods like raw frequency.

Data collection and analysis

Although ESP research into the language of specific disciplines (e.g., Mudraya, 2006), have drawn on the findings of large reference corpora like the BNC (British National Corpus), there has been a very strong tendency among researchers in ESP to build their own specialized corpora for their own specific purposes. This practice is followed by the present study where having selected the online articles (see 3.1.) for analysis, a corpus of bitcoin regulation articles was created and saved.

Since the TexStat tool did not manage to recognize all URL links, the selected internet articles were first made into txt format. As the main aim and purpose of the corpus is to analyze written texts for pedagogic purposes, first, a frequency word list related to bitcoin was created by the program. The results were then converted into an Excel spreadsheet to make it easier to read and work with.

The first frequency list contains both the general and technical terms. Interestingly enough, the figure 32 occurred the most frequently (973 times), followed by THE (748 times), figure 10 (505 times), OF (403 times) TO (361 times), AND (304 times), a (277 times) and IN (276 times) in the corpus.

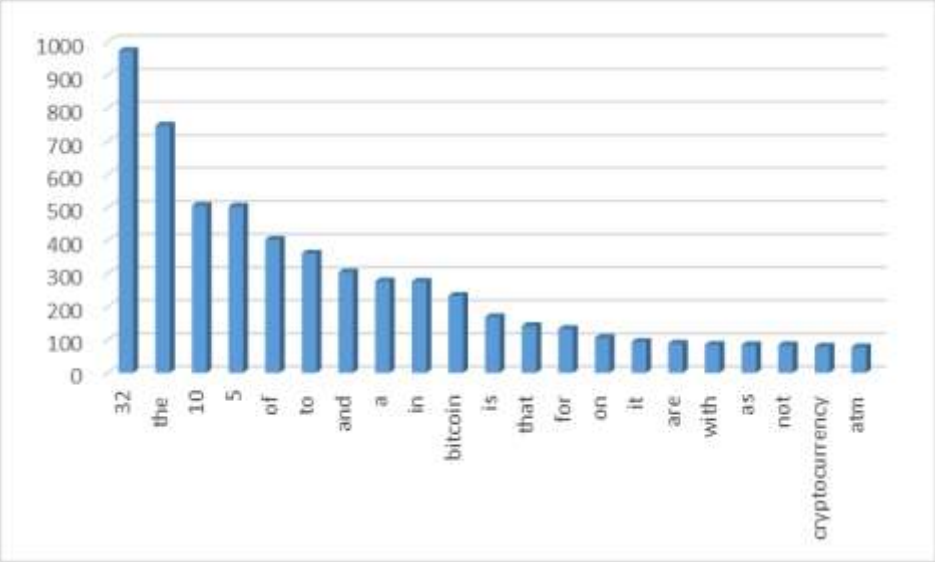


Figure 3
TextStat word frequency of lexical items

The identification of general, semi-technical and technical vocabulary was carried out based on empirical evidence. In order to avoid difficulties of identifying subject-specific technical and semi-technical lexis (Chung & Nation, 2004), a peer teacher of ESP was involved in the finalizing process of the Bitcoin word list. In line with Scott and Tribble (2006), the method for identifying the most frequent lexical items meant that the

frequency of the word type had to reach a threshold level of 10 occurrences. The semantic sets include: (1) words in connection with finance and (2) words that express activities related to finance. Consequently, the technical terms in Table 3 are BITCOIN (the 10th), CRYPTOCURRENCY (the 20th) and ATM (the 21st).

The unit of analysis, which provides rich data for teaching lexis is the word family (Bauer & Nation, 1993), which consists of a base word, its inflected forms and transparent derivations, e.g., uses-user-using-usage or regulate-regulations. This assumption refers to the fact that understanding a derived or inflected form of a word does not require extra effort from language learners if they are familiar with the base word.

It has been decided that names (e.g., Melissa, Mitchell) and the figures referring to years and amounts as well as, the acronyms (e.g., AML: Anti-money laundering; FINMA: The Swiss Financial Market Supervisory Authority; ICO: Information Commissioner's Office) have been eliminated from the corpus. The only acronym that was included in the analysis is ATM, which tends to be used by customers as a fixed expression, i.e., cash dispenser, and appeared to be the third most technical common word.

Then, a collocational analysis with a pedagogic aim has been carried out with the ten most frequent words, which include: bitcoin, cryptocurrency, ATM(s), participant(s), exchange(s), business(es), regulation(s), financial, service(s) and authority.

The analysis of the collocations has been done qualitatively focusing on collocations with a noun phrase/and prepositional phrase, with a verb phrase and with an adjective phrase. Table 1 gives an overview of all structural types of collocations in the corpus with the structural types, the corpus where it occurred and a sample collocation taken from the corpus.

Table 1
The structural types of collocations

Structural types	The corpus name	Sample collocation
Collocations with a noun phrase and/or a prepositional phrase	Canada.crp US Federal crp.	*installation of a bitcoin* *assets like bitcoin*
Collocations with a verb phrase	Canada crp.	*buy and spend bitcoin*
Collocations with adjectives and adverbs	Canada crp.	*bitcoin services*

Although the scope of the collocational analysis is rather limited, it yielded relevant insights into the lexical patterning in the corpus. In the next section an overview of findings of this study will be given.

FINDINGS AND DISCUSSIONS

As a first step in the analysis of the selected texts, the frequent lexical items in bitcoin texts were identified and analyzed. The final bitcoin world list contains a bit over 14.000 lexical items. The most frequent bitcoin-related words in the corpus are BITCOIN, CRYPTOCURRENY, ATM, PARTICIPANT, EXCHANGE, BUSINESS, REGULATION, FINANCIAL, SERVICE, AUTHORITY, CURRENCY, CASE, INVESTOR, etc., (see Figure 4).

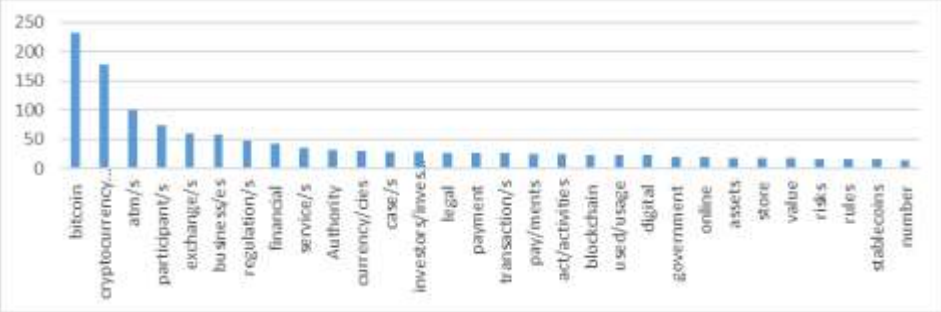


Figure 4
The 30 most frequent technical and semi-technical words

As can be seen is Table 5, some of the lexical items, such as PARTICIPANTS, ACT(IVITIES), CASE(S), USED (USAGE) and NUMBER might be considered as general vocabulary, but due to their high frequency in the business context, it has been decided to keep them anyway in the list of the most frequently occurring semi-technical lexical items. Based on the findings, the collocations made from the ten most frequent words were chosen for further analysis in order to gain insights into the most useful collocational patterns.

The most frequently occurring lexical unit, BITCOIN forms a collocation with the following verbs: *buy* and *sell, accept, collateralize, invest, purchase, spend, steal* and *withdraw* (see Swiss crp.). The noun and prepositional phrases with BITCOIN, however, show a very diverse picture: *bitcoin as an investment, investment in bitcoin, demand for bitcoin, the usefulness of bitcoin, the price of bitcoin, as with bitcoin ATMs, bitcoin per bitcoin transfer, assets like bitcoin, bitcoin as a store of value* and *taxes on bitcoin*. BITCOIN as an adjective most often combines with the following nouns: *services, purchases, ATMs, community, savings account, marketplaces, price* (see in Hungary 2crp. and US Federal crp.)

The second most frequent lexical item, CRYPTO or CRYPTOCURRENCY as an adjective, very often combines with the nouns: *advertising/advertisements, contracts, exchange(s), enthusiasts, firms, licensing, market, platforms, providers, rules, transactions, investment* or *assets* (see in Hungary 2crp. Swiss2 crp, Canadian2 crp, and US crp and Singapore crp.). For instance, *make cryptocurrency transactions less anonymous, cryptocurrency firms that advertise in Spain,* etc. As regards the noun phrases with cryptocurrency, mainly, the trade and legal issues are discussed in the articles, e.g., *the laws on cryptocurrency, capital gains taxes from cryptocurrency, the nation's laws on cryptocurrency, make cryptocurrency enthusiast more likely to self-report* or *entice the cryptocurrency market* (see in Hungarian crp.)

The third most often used lexical item, the acronym ATM, occurs in the Canadian corpus 76 times. In most cases ATM does not stand alone, but together with the adjective 'bitcoin'. The following words make a collocation with ATM either as a noun or verb

phrase: *introduce, install* and *use*, e.g., *installation of a bitcoin ATM* or *installing a bitcoin ATM*. Some other verbs, such as *have, own, monitor, put in, keep*, and *remove* are also used by the writers together with ATM, e.g., *put in the bitcoin ATM*. Examples for adjective phrases in the corpus are: *bitcoin ATM operator, bitcoin ATM transaction fees, bitcoin ATM usage level* and *bitcoin ATM users* (see Canada corp.).

The reason for the high occurrence of PARTICIPANTS in the Canadian corpus was that the article reported about research conducted on the usage of bitcoin. It has been decided to include this article in the corpus because the participants clearly stated their opinions about bitcoin using a number of very useful verb phrases, e.g., *several participants are skeptical, participant suspected some sort of wrongdoing, participants were aware of 16 scam occurrences, some participants who noticed scam victims*, and *participants meant it is risky*. Only a few examples for noun phrases could be found in the interview: *participants form a variety of types, participants' view, participants on usage trends* or *indication from some participants.*

The fourth most common word EXCHANGE(S) collocates with the words: *cryptocurrency* and *digital*, e.g., *the growth in the digital exchanges, regulating cryptocurrency exchanges, FATF standards in digital exchanges*, and *PSA governs digital exchanges* (see in Swiss2 crp. and US crypto.crp, Singapore 2crp.).

When talking about buying and selling bitcoins, BUSINESS as an activity to make money is essential. It combines with a number of prepositional phrases, such as *the new digital way of doing business, visitors to business, perceived value to the business, manager of/at the business, income to the business, customers of the business, not safe for a business, the number of businesses* or *in any way in their business*, just to name a few. Besides, BUSINESS as an adjective is used by the authors with the nouns: *decision, owners, behavior, location* or *accounting systems*, e.g., *the most common type of business location or personal business decision* (see in the Canada crp.).

The sale of cryptocurrency is generally regulated under state law. REGULATION in the articles forms a collocation with the following adjectives: *new, potential future, cryptocurrency* and *with official* (see in the US federal crp and Singapore 2crp.). As the derived form of 'regulation' does not require extra effort from the language learner, therefore, REGULATORY has been examined, too. The word 'regulatory' is usually used with *approach, framework, oversight, environment* and *actions* most frequently (see UK.crp.)

Crypto-assets and services have grown rapidly in recent years and are becoming increasingly interlinked with the regulated financial system. As a result, the adjective FINANCIAL occurs quite often and forms a collocation with *crisis, market, institutions, legislation, safeguards, standards system, stability,* and *world* (see Swiss2 crp., US crypto crp., and UK crp.).

Quite surprisingly, in the Swiss article, the only concordance with SERVICE is *service provider(s)* (6 times). At the same time SERVICE(S) in the Singapore article combines with *payment* and *crypto-related* (see Singapore 2crp.).

Since the use of cryptocurrencies is regulated differently in each country, it is not surprising that the role of the authority as an enforcer of the regulations is enhanced. The word that collocates with AUTHORITY in the Hungary corpus is *tax* (12 times), and in the Singapore 2 corpus, *monetary authority*.

As a medium of exchange through a computer network, cryptocurrency is a digital currency, although despite its name, it is not considered to be a currency in the traditional sense. The word CURRENCY is used in the texts with the following adjectives: *central bank digital currency, Swiss community currencies, (least-circulated) fiat currency, government-backed fiat currencies* or *a central bank-backed digital currency* (see Swiss bitcoin.crp. and US Federal.crp.).

It is not surprising that the noun CASE(S) often refers to legal issues, as in many countries in the world there are no legal regulations on cryptocurrencies and are still cash-driven, e.g., *in tax litigation cases, an increasing number of cases* or *repeated in these cases*. The verbs that combine with CASE are the following: *win cases, contend such cases* and *cases can be disputed* (see in Hungary crp.).

INVESTOR(S) committing capital with the expectation of receiving financial returns occurs in the corpora with the following collocations: *luring investors, warned investors* or *investors buying bitcoin* (see in US Federal crp., UK2 crp.).

The results of this study can be used in in Business English classes to enhance vocabulary (Nation, 1991; Pathan, Ismail & Soomro, 2019) and provide context for discussions or activities related to cryptocurrencies and financial technology.

There are a number of ways to incorporate the most frequently occurring words and collocations into the classes (Moon, 1998, 2000; Nattinger & DeCarrico, 1992). For instance, students can be encouraged to create sentences or short paragraphs using these words to demonstrate their understanding.

Also, debates on topics like the regulation of cryptocurrencies, the role of financial authorities, or the benefits and risks of investing into bitcoin can be initiated on the basis of crypto regulation reports released annually.

As regards reading and writing activities (Pathan, Ismail, & Soomro, 2019)., students may themselves identify and highlight the bitcoin-related words they come across in the news. In addition, students can be asked to write summaries or reflections on the readings, incorporating the words contextually (Veljanovszki & Zsubrinszky, 2014).

Simulations of real-world scenarios (Larréché, 1987), such as setting up a bitcoin ATM business or providing financial services related to cryptocurrencies can also be conducted in class. Furthermore, by exploring case studies or real-life examples of businesses or participants in the bitcoin system, students can present their findings in class.

CONCLUSION

The results of the present study have implications for the teaching of Business English and for course and materials design. Although it is small-scale research, it can provide an insight into the most frequently used word combinations in the field of cryptocurrencies. Lexis was examined by its frequency and in the form of collocations at a semantic level. As far as the collocational patterns are concerned, results indicate a certain degree of fixedness at semantic levels. The proportion of high frequency general and technical lexis in online articles is similar to findings of the lexis in specialized texts.

It can be concluded that it is a lot easier to statistically count occurrences of words than it is to say why they are there in the first place, or why they occur in the pattern that they do. This exploratory study, however, can give the opportunity to take advantage of the very best sources of information which can be utilized to perform further analysis and to generate text-based language practice exercises. The study offers novel contributions to corpus linguistics, register analysis in ESP and pedagogy.

Bitcoin-related vocabulary can be integrated into other subjects, such as economics, finance or technology, allowing students to explore the connections between different fields of knowledge. Another possibility might be collaboration with teachers from other disciplines by creating interdisciplinary projects related to cryptocurrencies.

Further research on a wider scale is recommended where Artificial Intelligence, a rapidly advancing technology, might come in useful. At the same time, it is crucial to adjust the difficulty level and complexity of the tasks based on the students' language proficiency and familiarity with the subject.

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