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Audit and accounting considerations on cryptoassets and related transactions

Abstract

Introduction. The rapid rise and volatility of cryptoassets have led to increased global interest by governments, investors, regulators. In 2020, the market capitalization of cryptocurrencies increased to USD 758.06 billion by expert estimations. Each of the cryptoassets has its own unique features and characteristics which makes their accounting and auditing challenging. The lack of official accounting and auditing guidance for cryptoassets and related transactions impose additional audit risks that should be measured properly before the client-acceptance stage and planning audit procedures. We developed a model which links financial statement assertions, identified cryptoassets' risks that should be considered during the audit, and related controls in response to such risks.

The purpose of this paper is to identify cryptoassets framework for audit planning and gathering audit evidence to support management assertions regarding their financial statements.

Methods. This paper adopts an empirical research approach with application of auditing and analytical procedures. In a comprehensive analytical overview of trends in cryptoassets market capitalization, the authors have used statistical methods and structural analysis, the selected sample includes daily data of cryptoassets market capitalization during January 2016 - February 2020.

Results. According to the conducted research, the auditors have to consider whether to accept or continue an audit engagement when an entity has engaged in material cryptocurrency transactions; the auditors have to identify and assess risks of material misstatement in financial statements related to cryptoassets transactions and balances. We suggested a possible substantive audit procedures for cryptoassets and related transactions, such as: inspection of the wallets and verification the balances on them; confirmation by a third party (traders); inspection of documents supporting ownership of the asset (white papers, agreements with crypto-traders); testing client internal controls system and controls that are implemented to ensure the security of the private key of crypto-wallet.

Conclusions. It is becoming common for financial statements to show cryptoassets balances and reflect the results of cryptoassets transactions, however, many auditors may have little or no experience with cryptoassets and therefore may not fully appreciate the challenges that auditing these items may present. The auditors need to identify and assess risks of material misstatement throughout the process of obtaining an understanding of the entity and its control environment, and evaluate the potential effect of that risks on financial statements.

Keywords: Cryptoassets; Cryptocurrency; Auditing of Cryptoassets; Cryptoassets Internal Control Framework; Decentralized Finance; DeFi; Assertions

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Аудит і бухгалтерський облік операцій із криптоактивами

Анотація. *Вступ.* Швидке зростання та нестабільність криптоактивів призвели до збільшення глобального інтересу до цього виду цифрових фінансових активів зі сторони урядів різних країн, інвесторів і регуляторних органів. Протягом 2020 року ринкова капіталізація криптоактивів зросла до 758.06 млрд. дол. США згідно з експертними оцінками.

Кожен вид криптоактивів має свої унікальні особливості та характеристики, що суттєво ускладнює їх бухгалтерський облік й аудит. Через відсутність офіційних вказівок щодо бухгалтерського обліку та аудиту операцій із криптоактивами від міжнародних бухгалтерських організацій виникають додаткові аудиторські ризики, які мають бути належно оцінені до етапу прийняття нового клієнта та планування аудиторських процедур. Ми розробили модель, яка пов'язує твердження фінансової звітності; ризики щодо операцій із криптоактивами, які слід враховувати під час аудиту; та відповідні засоби контролю у відповідь на ці ризики.

Метою цієї статті є розроблення методики аудиту операцій із криптоактивами на етапах планування та збору аудиторських доказів у відповідь на твердження керівництва щодо їх фінансової звітності.

Методи. У цій роботі застосовано емпіричний підхід до дослідження із застосуванням бухгалтерських та аналітичних процедур та проаналізовано міжнародні стандарти аудиту. Проведено аналіз стану та змін ринкової капіталізації криптоактивів із застосуванням статистичних методів та методів структурного аналізу. Проаналізована вибірка включає щоденні дані про ринкову капіталізацію криптоактивів протягом січня 2016 – лютого 2020 років.

Результати. Згідно з проведеним дослідженням, аудитори за власним судженням повинні проаналізувати, приймати чи продовжувати аудиторське завдання, коли суб'єкт господарювання здійснює суттєві операції з криптоактивами; аудитори повинні виявляти та оцінювати ризик суттєвого викривлення в фінансовій звітності, що пов'язаний із операціями з криптоактивами. Перед прийняттям нового клієнта аудитори мають проаналізувати обсяги операцій із криптоактивами на предмет суттєвості й оцінити можливі ризики викривлення інформації у фінансовій звітності, пов'язані з цими операціями. Аудиторам необхідно виявляти та оцінювати ризик суттєвого викривлення щодо операцій із криптоактивами протягом усього процесу отримання розуміння суб'єкта господарювання та середовища його контролю й оцінювати потенційний вплив цих ризиків на фінансову звітність.

Висновки. Аудиторськими процедурами щодо операцій із криптоактивами є: перевірка (інвентаризація) криптогаманців та залишків криптоактивів на них; запити-підтвердження від третіх сторін (криптові біржі, обмінники); перевірка документів, що підтверджують право власності на ці активи (технічні документи, угоди з криптотрейдерами); тестування системи внутрішнього контролю клієнта й окремих засобів контролю, які реалізовані для забезпечення безпеки приватного ключа криптогаманця, тощо.

Ключові слова: криптоактиви; криптовалюта; аудит криптоактивів; система внутрішнього контролю криптоактивів; твердження фінансової звітності.

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Аудит и бухгалтерский учет операций с криптоактивами

Аннотация. *Вступление.* Быстрый рост и нестабильность криптоактивов привели к увеличению глобального интереса к этому виду цифровых финансовых активов со стороны правительств разных стран, инвесторов и регулирующих органов. В течение 2020 года рыночная капитализация криптоактивов возросла до 758.06 млрд. долл. США.

Каждый вид криптоактивов имеет свои уникальные особенности и характеристики, что существенно затрудняет их бухгалтерский учет и аудит. Из-за отсутствия официальных указаний по бухгалтерскому учету и аудиту операций с криптоактивами от международных бухгалтерских организаций возникают дополнительные аудиторские риски, которые должны быть оценены на этапе принятия нового клиента и планирования аудиторских процедур. Мы разработали модель, которая связывает утверждение финансовой отчетности; риски, которые следует учитывать в ходе аудита; и соответствующие средства контроля в ответ на эти риски.

Целью этой статьи является разработка методики аудита операций с криптоактивами на этапах планирования и сбора аудиторских доказательств в ответ на утверждение руководства в финансовой отчетности.

Методы. В этой работе применен эмпирический подход к исследованию с применением бухгалтерских и аналитических процедур. Проанализированы международные стандарты аудита. Проведен анализ изменений рыночной капитализации криптоактивов с применением статистических методов и методов структурного анализа. Проанализированная выборка включает ежедневные данные о рыночной капитализации криптоактивов в течение января 2016 – февраля 2020 годов.

Результаты. Согласно проведенному исследованию, аудиторы по собственному суждению должны проанализировать, принимать или продолжать аудиторское задание, когда субъект хозяйствования осуществляет существенные операции с криптоактивами; аудиторы должны идентифицировать и оценивать риск существенного искажения в финансовой отчетности, связанный с операциями с криптоактивами. Перед принятием нового клиента аудиторы должны проанализировать объемы его операций с криптоактивами на предмет существенности и оценить возможные риски искажения информации в финансовой отчетности, связанные с этими операциями. Необходимо выявлять и оценивать риск существенного искажения операций с криптоактивами в течение всего процесса получения понимания бизнеса предприятия и среды его контроля и оценивать потенциальное влияние этих рисков на финансовую отчетность.

Выводы. Аудиторскими процедурами операций с криптоактивами являются: проверка (инвентаризация) криптокошельков и остатков криптоактивов на них; запросы-подтверждения от третьих сторон (криптовалютные биржи, обменники) проверка документов, подтверждающих право собственности на эти активы (технические документы, договора с криптотрейдерами) тестирование системы внутреннего контроля клиента и отдельных средств контроля, которые реализованы для обеспечения безопасности частного ключа криптокошелька.

Ключевые слова: криптоактивы; криптовалюта; аудит криптоактивов; система внутреннего контроля криптоактивов; утверждение финансовой отчетности.

1. Introduction

Nowadays a new term, such as «Decentralized finance» has arisen due to the social, economic and technological changes caused by distributed ledger technology (DLT) implementation and global changes in digital economy. Decentralized finance, also known as DeFi, is a fast-growing sector of the cryptoassets industry. While cryptocurrency coins create a decentralized store of value separate from any government-backed fiat currency, DeFi creates decentralized financial instruments separate from traditional centralized institutions. The rapid rise of cryptoassets has led to increased global interest and scrutiny by organizations, investors, regulators, governments and others. During 2020, the market capitalization of cryptocurrencies increased by USD 30,529 million or by 14.7% (Figure 1). According to other expert estimations, the market capitalization of cryptocurrencies increased to USD 758.06 billion by the end of 2020.

Each of these cryptoassets has its own unique features and characteristics which makes accounting and auditing of them challenging. The distributed ledger technology is widely used in different fields now (Figure 2).

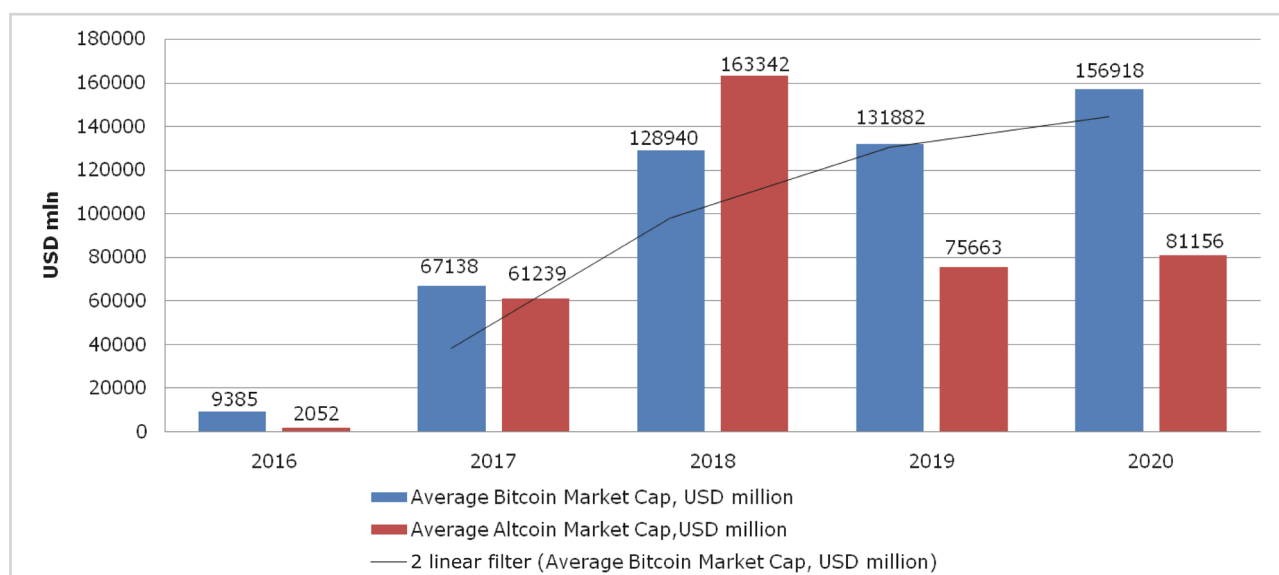


Figure 1:

Cryptoassets average market capitalization (2016-2020)

Source: Compiled by the authors based on data from Coinmarketcap (2020)

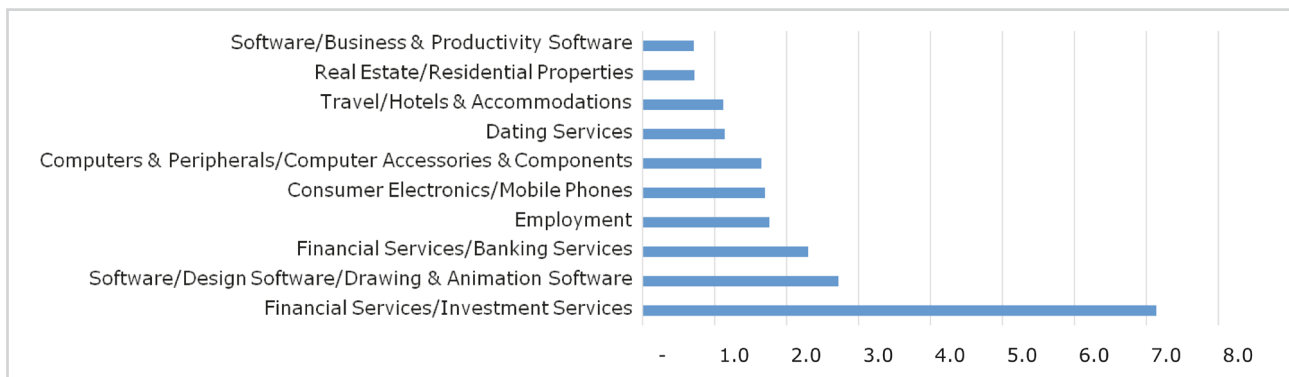


Figure 2:
Bitcoin Community Interests

Source: Compiled by the authors based on data from Google Analytics (2020)

The lack of the official accounting and auditing guidance for cryptoassets and related transactions impose additional audit risks that should be measured properly before the client-acceptance stage and audit planning procedures.

Research methodology. This paper adopts an empirical research approach with application of accounting and analytical procedures. In a comprehensive analytical overview of trends in cryptoassets market capitalization, the authors have used statistical methods and structural analysis. The selected sample includes daily data of cryptoassets market capitalization during January 2016 - February 2020. **Results.** According to the conducted research, the auditors have to consider whether to accept or continue an audit engagement when an entity has engaged in material cryptocurrency transactions; identifying and assessing risks of material misstatement in financial statements related to cryptoassets transactions and balances. We suggested a possible audit procedures for different types of cryptoassets.

2. Brief Literature Review

Recent years, there were numerous attempts to define an accounting treatment for a new digital class of assets - cryptoassets, however there were little research on audit of cryptoassets and related transactions. Much of the current literature on cryptoassets accounting pays particular attention to financial statement assertions while preparing the control matrix. Thus, Vincent and Wilkins (2020) developed a four-quadrant model to assist auditors in client acceptance and continuance decisions and identified cryptocurrency risks that should be considered during audit planning and audit evidence gathering. Garewal (2020) and Jin, Changyu and Francesco (2020) analyzed practical blockchains and cryptocurrencies issues in terms of the fundamental unit of interaction - transaction where value is transferred from one entity to another. The author defined the blockchain as an immutable, distributed ledger of all of the transactions that have transpired on the network.

Alzoubi (2018) studied initial evidence regarding the relationship between audit quality, debt financing, and earnings management. The study used the cross-sectional version of the modified Jones model, in which discretionary accruals were employed as a proxy for earnings management. Ankenbrand et al. (2020) investigated different developments in the distributed ledger technology that have led to the new types of assets with a broad range of purposes. They performed classification frameworks for common instruments from traditional finance and for new cryptographic assets. The authors proposed a taxonomy, which is an extension of existing classification frameworks that could be widely used in transformation of auditing audit procedures.

Brammertz and Mendelowitz (2018) defined the digital currencies in terms of digital finance and demonstrated the importance of a cash flow generating standard for individual financial contract level data and the ability to create such a standard.

There is an increasing amount of literature on auditing, risk assessment and internal control testing, thus Bhattacharjee, Moreno and Pyzoha (2020) examined the influence of an audit committee that encourages auditors (partners and managers) and clients (CFOs and controllers) to consider an accounting dispute from the other party's perspective. Carcell et al. (2020) examined whether internal auditing provides value to organizations by reducing risk. The authors compared the changes in risks between audited business units and matched non-audited units within

the same company. They found that companies that have had a quality assurance review are associated with greater reductions in risk and improved overall performance.

Numerous studies have attempted to evaluate the effect of cryptoassets transactions on company's going-concern. Xu and Kalelkar (2020) examined whether inaccurate going-concern opinions negatively affect the audit office's reputation. While Kaplan et al. (2020) evaluated the effects of the type and content of audit reports for financially stressed Initial public offerings on information uncertainty.

Ukrainian authors have also studied an accounting treatment and audit of cryptoassets and related transactions. Yatsyk (2017) described the accounting methodology of cryptocurrency as special type of electronic money, further this author (Yatsyk, 2018) examined the methodology of financial accounting of cryptocurrencies according to the IFRS and proposed to define the cryptocurrencies as a new class of digital assets rather than electronic money. Brukhanskyi and Spilnyk (2019) examined the prospects for solving the problem of integrating new cryptographic objects into the accounting and reporting system. Derun and Mysaka (2018) analyzed the influence of stakeholder perception of financial performance on corporate reputation. They described the diversity of corporate reputation concepts and its comprehensive reflection in financial statements, which could be applicable while assessing whether to accept or continue an audit engagement when an entity has engaged in material cryptocurrency transactions. Other authors (Tarasova et al., 2020, Petruk et al., 2019) studied the definition of cryptocurrency and its financial accounting treatment.

3. Purpose

The purpose of the research is to examine the cryptoassets audit framework for audit planning and gathering audit evidence to support management assertions regarding their financial statements; to identify risks related to cryptoassets financial statement assertions and establish special audit procedures in response to these risks.

4. Results

Auditing cryptoassets and related transactions requires a different knowledge, methods and approaches than the other assets in the financial statements. There are over 7,186 different types of cryptoassets (Coinmarketcap, 2020) and each one has its own characteristics and particularities. The enterprise blockchain market is expected to reach USD 21 billion over the next five years. Therefore, it is extremely important that the auditor uses these special knowledge and considerations during planning and execution stages. Several factors make the auditing process complicated: an extreme amount of cryptoassets types with different characteristics, the complexity of cryptoassets platforms, rapid changes, market volatility, lack of regulations on cryptoassets and the fact that certain technologies are still evolving. One issue specifically related to blockchain technology is the «proof-of-work» concept, as a result, auditors have to use the work of experts in cryptoassets technologies to evaluate the proof of existence and ownership of such assets and calculate their fair value.

A large number of European countries are developing their own regulation for cryptoassets. Thus, Switzerland was one of the first countries to start researching the legal treatment of cryptocurrencies. The Swiss Federal Council published a comprehensive report titled the Legal Framework for Distributed Ledger Technology and Blockchain in Switzerland (2018). It addresses the legal treatment of cryptocurrencies, blockchain, distributed ledger technologies under the current legal framework. The report acknowledges that there is a selective need for new regulation to cover open questions, for example the treatment of cryptocurrencies.

Professional service giants such as the Big Four companies, comprised of Ernst & Young (EY), Deloitte, PwC and KPMG, are innovating in the blockchain and crypto space. Thus, KPMG offers a number of blockchain-based software solutions. Ghosh (2020) reported that the firm saw a marked increase in revenue coming from blockchain initiatives last year. Ghosh expects growth in enterprise blockchain and network-based models that support «COVID safe» supplies, identities and products. He claims that this is already being seen as there is increasing intersectionality with other technologies like IoT, AI and Machine Learning.

PwC today is arguably the Big Four Company that is the most proactive in exploring cryptoassets and blockchain. The company invested in VeChain, a large cryptocurrency startup specializing in web services, supply chain management and anti-counterfeiting. Most recently,

PwC announced the release of a cryptocurrency auditing software solution. The company updated its software auditing solution by providing independent evidence of private-public key pairing and collecting information from blockchains.

The main issues for cryptoassets auditing are: the lack of special knowledge of audit staff in terms of digital assets accounting; the absence of consistent legal and regulatory guidance for cryptoassets; the lack of prior years' experience. All these factors have a significant influence on the estimation of resource requirements for an audit engagement and are shown in Figure 3.

It is known, that professional services providers have released a number of detailed reports on blockchain and digital assets. Arslanian (2020) noted that PwC recently published 2020 Crypto Hedge Fund report (PwC, 2020), which shows the total assets under management of crypto hedge funds globally increased to over USD 2 billion in 2019, as compared to USD 1 billion from the previous year (Wolfson, 2020).

Chief crypto analysts Villaverde and Ng (2020) noted that when more of the Big Four firms start leveraging the power of public blockchains, there will be more of an impact in terms of public adoption. Currently, it seems as though EY is the only firm interested in public blockchain innovation.

EY is also driving innovation in the blockchain space. Brody (2020), confirmed that the firm has been working with Microsoft and ConsenSys to develop an open-source blockchain project called Baseline Protocol, which runs on the public Ethereum mainnet. EY has released more solo crypto-related software projects than any of its Big Four rivals. First, in April 2018, EY announced Blockchain Analyzer, becoming the first mainstream auditor to offer its services specifically for the needs of cryptocurrency companies.

Although in March, 2019, the International Financial Reporting Interpretations Committee (IFRIC) issued «Holdings of Cryptocurrencies Agenda Paper 4» (IFRIC, 2019) stating the accounting treatment for holding cryptocurrency follows the International Accounting Standard (IAS 38) Intangible Assets (IAS, 2004), neither the Financial Accounting Standards Board (FASB), the Auditing Standards Board (ASB) nor the PCAOB have issued formal guidance for accounting or auditing cryptocurrency.

It is known, that PCAOB auditing quality control standards require special quality control procedures on audit client acceptance and continuance that should be performed by auditors; specifically, audit firm policies should provide reasonable assurance that the firm has the competence to perform the engagement and consider relevant risks appropriately (PCAOB, 2003). Therefore, when considering whether to accept or retain a client with cryptoassets and related transactions,

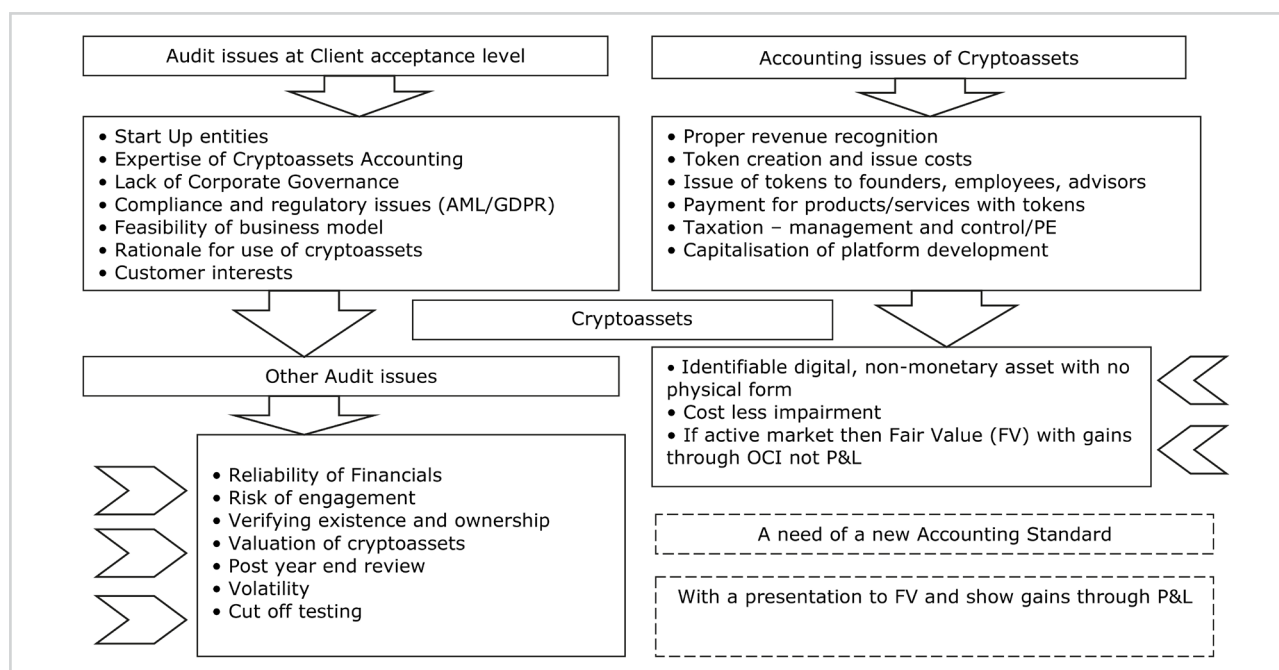


Figure 3:
Audit and accounting issues for cryptoassets
Source: Compiled by the authors

the auditing firm should consider whether its staff has the required competence and resources to complete such an engagement.

Auditors need to consider whether cryptoassets transactions have a business purpose related to the client’s business strategy. Furthermore, auditors should also estimate the clients’ competence in cryptoassets accounting and financial reporting; understand whether the client uses any cryptoassets risk management framework; identify and evaluate client’s internal control system and evaluate ability to establish and maintain such internal controls to mitigate the identified risks associated with cryptoassets.

The auditors should increase their competence level in terms of accounting, auditing of cryptoassets and related transactions through education and additional training, using the work of experts. Auditors have to consider investing in developing special software that will help address some of the risks related to transactions with cryptoassets.

The framework (Table 1) summarizes commonly used financial assertions, current audit procedures, and additional risks that should be considered when planning and performing an audit.

It is common for an entity to use an online exchange to enter into cryptoassets transactions, therefore while assessing the risks, the auditor have to consider whether the class of transaction with cryptoassets is significant or not. To do this, the auditor need to calculate the planning materiality (Figure 4) and compare the cryptoassets balances to the threshold. Then the auditor check whether the entity use a crypto-exchange that have effective controls over the transactions it enters into on behalf of the entity or over the balances of cryptoassets maintained in the entity’s accounts. In some cases, the entity may use a crypto-wallet hosted by the exchange. Thus, the auditor have to consider: who owns and operates the exchange, and its reputation; the country in which the exchange is located; exchange’s liquidity and trading volume; controls the exchange has in effect related; whether the exchange provides a service auditor’s report on the effectiveness of its controls over cryptoassets transactions.

This risk of material misstatement regarding completeness of cryptoassets and related transactions may be difficult to assess. The public keys and related addresses in a blockchain do not make transparent the identities of the parties participating in transactions. The failure to identify a wallet owned by the entity may be inadvertent, thus the auditor need to evaluate the effect of this risk on the financial statements.

Table 1:
Cryptoassets audit framework

Financial assertions	Risks	Audit procedures at the assertion level
Existence (E)	Client’s cryptoassets don’t exist. There are no such assets on e-wallets. The risk that an unauthorized party accesses the wallet. Transactions are not yet added to the blockchain. Related-party transaction risk.	Confirmation by a third party (traders). Getting a list of different wallet accounts. Inspection of the wallets and verification the balances on them. Inspection of documents supporting ownership of the asset (white papers, agreements with crypto-traders). Inquiry of management. Test controls that are implemented to ensure the security of the private key of crypto-wallet.
Rights and Obligations (R&O)	The client does not own the cryptoasset.	Confirmation by crypto-traders, providers, exchanges. Inspection of white papers. Inquiry of management. Inspection of Client’s minutes. Check of the proof of ownership for the cryptoasset and for the private key.
Completeness (C)	Not all transactions with cryptoassets are recorded in accounting system. There are hidden wallets.	Reconciliation of transactions from DLT to a journal ledger. Inquiry of management. Testing client internal controls system.
Accuracy and valuation (A&V)	Recorded transactions contain errors. Transaction recorded at the incorrect dollar amount.	Accuracy test of a sample of transactions. Test of the documents’ source to verify the validity of the amount. Trace of the transaction to the account.
Cutoff	Transactions recorded in the incorrect period.	Focus on transactions that occur during the end of the period checked and the beginning of the subsequent period. Analysis of all delays in processing and confirming the cryptocurrency transactions. Obtaining a list of transactions from a wallet, exchange given a certain cutoff date.
Presentation and disclosure (P&D)	Not all disclosures required Included. Relevant accounting policies for cryptoassets are not disclosed.	Completion of the disclosure checklist. Obtaining a management representation letter. Evaluate the client’s internal control system.

Source: Compiled by the authors

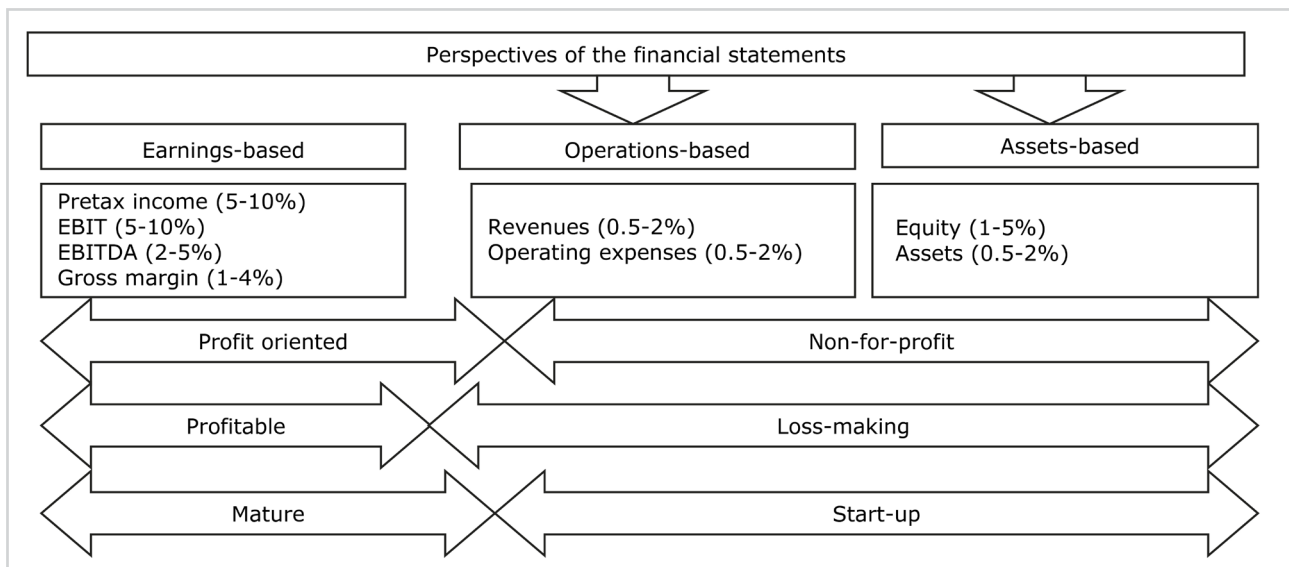


Figure 4:
Measurement basis for planning materiality
Source: Ya. Ishchenko (2016b)

Another risk to consider - is the loss of the private key and as a result the loss of access to the related cryptoassets. Possible controls to reduce this risk could be the implementation of special back up policies and procedures and establishing appropriate segregation of duties.

5. Conclusion

According to the proposed framework, for the purpose of identifying and assessing risks of material misstatement the auditor has to:

- identify risks throughout the process of obtaining an understanding of the entity and its environment, including relevant controls that relate to the risks; assess the identified risks and evaluate the potential effect on assertions;
- relate the identified risks to what can go wrong at the assertion level;
- consider the likelihood of misstatement and a magnitude that could result in a material misstatement.

According to the research, in an environment where robust controls have been proven effective throughout a business' crypto currency activities, auditors need to introduce a special IT audit solution, which: provides independent, substantive evidence of the «private key and public address pairing» which is needed to establish ownership of cryptocurrency; securely interrogates the blockchain to independently and reliably gather corroborating information about blockchain transactions and balances. This solution has to support most types of cryptoassets such as: Bitcoin, Bitcoin Cash, Bitcoin Gold, LiteCoin, Ethereum, Tezos, ERC20 tokens and etc. In this paper we have examined the cryptoassets audit framework for audit planning and gathering audit evidence to support management assertions regarding their financial statements.

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