A comparative analysis of cryptocurrency wallet management tools

Analiza porównawcza narzędzi do zarządzania portfelem kryptowalut

Kamil Biernacki*, Małgorzata Plechawska-Wójcik

Department of Computer Science, Lublin University of Technology, Nadbystrzycka 36B, 20-618 Lublin, Poland

Abstract

The work is devoted to a comparative analysis of tools for managing a cryptocurrency portfolio. The study aimed to find out which of the tools is currently the best solution for users. This analysis was carried out on the basis of two tools, first: a survey conducted of among 41 responders who are cryptocurrency users, and the second one: cognitive walkthrough. Conducted analysis confirmed the thesis that the Trust Wallet tool is currently the best solution for users.

Keywords: cryptocurrency; blockchain; user experience; usability

Streszczenie

Praca poświęcona jest analizie porównawczej narzędzi do zarządzania portfelem kryptowalut. Badanie miało na celu stwierdzić, który z portfeli stanowi obecnie najlepsze rozwiązanie dla użytkowników. Analiza ta została przeprowadzona na podstawie dwóch narzędzi, pierwszego: ankiety przeprowadzonej wśród 41 respondentów, którzy są użytkownikami kryptowalut, oraz drugiego: wędrówki poznawczej. Wykonana analiza potwierdziła tezę, że portfel Trust Wallet stanowi obecnie najlepsze rozwiązanie dla użytkowników.

Słowa kluczowe: kryptowaluty; łańcuch bloków; doświadczenie użytkownika; użyteczność

*Corresponding author

Email address: **kamil_biernacki@pollub.edu.pl** (K. P. Biernacki)

1. Introduction

Nowadays, cryptocurrencies have become an area of interest for many people in their daily lives. Cryptocurrencies allowed many people to get rich for others, they brought losses. Cryptocurrency basically speaking, it is a virtual money that does not have its physical form [1]. The first cryptocurrencies appeared in 2008, but their popularity was related to the creation of bitcoin, which was found in the last quarter of this year [2].

Most cryptocurrencies use a decentralized system based on blockchain technology [3]. Blockchain technology is a chain of blocks that are linked chronologically using cryptography. Blockchain is distributed and saved on a peer-to-peer network, without a centralized server, formed by computers connected to each other on the network using a consensus algorithm. Blockchain has many desirable values, including consistency and irreversibility. Each cryptocurrency must be mined, and there are various method dedicated to this process [4]. Mining is used to check the correctness of the transaction and for this effort miners receive a new cryptocurrency. Bitcoin is the most popular cryptocurrency, but there are other cryptocurrencies that serve different purposes.

Cryptocurrencies, for security purposes, use an asymmetric cryptography, including two: private and public keys. The public key can be freely accessed, it is used to send funds to the cryptocurrency wallet. It is used to encrypt information, while the private key is used to read and must not be shared. Sharing the private key may allow people to give up control over the cryptocurrency [5]. These keys are managed by tools called a cryptocurrecy wallet, which, through the interface, allow users to access cryptocurrencies. Therefore it is worth comparing them. According to article [6], payments made in crytocurrencies ensure minimal costs, because there are two nodes that carry out transactions directly with each other, there is no need to include third parties.

There are many research papers exploring the possibilities and limitations of cryptocurrencies and their functioning in the economy. The article [7] describes the use of the bitcoin cryptocurrency in the modern world and attempts to assess whether bitcoin can replace traditional currencies. Research has shown that bitcoin has the potential to become an essential element in the economy, but it lacks the features that will allow it to replace the world's major currencies.

In the article [8] a usability study was conducted on the basis of the analytical Cognitive Walkthrough method for three popular cryptocurrencies and their wallets. In the study, participants were asked to perform tasks that tasks that allow investigate common usability issues with desktop and mobile-based wallets. Research has shown that currency wallets used to use cryptocurrencies suffer from serious usability issues, in particular for ordinary users, which is also confirmed to some extent by the article [9].

Paper [10] defines how cryptocurrencies build a fully decentralized financial system, independent of governments. The study concluded that the development of a new virtual monetary system has its relevance as a service or payment for online purchases that are currently gaining strength. Therefore, people are inclined to buy and sell online with bitcoin, so this new financial system would be very well received.

Bitcoin, being the most popular currency, is often analyzed. The publication [11] presents a survey of 990 bitcoin users, where it was examined how users experienced bitcoin in terms of security, privacy, and anonymity. The study found that users still had problems with bitcoin management, including not using all the security features of bitcoin cryptocurrency.

A study [12] examined the security of commonly used cryptocurrency applications for Android, which found that conventional financial services applications are slightly better than cryptocurrency applications in terms of security, but they offer greater privacy.

2.   Purpose of work

The aim of the work is to conduct a comparative analysis of selected cryptocurrency management tools. The study aims to find out which tool is currently the best solution for users. This analysis was carried out on the basis of two tools, first: a survey among cryptocurrency users, and the second one: cognitive walkthrough. The thesis was based on the current observation of the market situation.

Thesis: Trust Wallet is currently the best cryptocurrency management tool.

Detailed research questions:
1. Does the Trust Wallet cryptocurrency wallet tool have the best functionalities in the opinion of users?
2. Is the user interface of Trust Wallet useful?
3. Is Trust Wallet the most popular tool among users?

3.   Materials and methods

Tools for managing cryptocurrencies, in other words cryptocurrency wallets, were created with the emergence of the first Bitcoin cryptocurrency. The first cryptocurrency management tool was Bitcoin Core for desktops, which was dedicated to manage only Bitcoin. Since then, many types of wallets have emerged. There are different types of cryptocurrency wallets that can be divided into groups.

Contrary to popular belief, cryptocurrency management tools do not actually store cryptocurrencies, but provide tools for interacting with the blockchain network. They generate the information necessary to send and receive cryptocurrencies via the blockchain. Cryptocurrency management tools contain an address, which is an alphanumeric identifier generated from public and private keys. An address is a specific location on the blockchain to which transactions can be performed.

Desktop Wallet: Desktop wallets are available on most operating systems such as Windows, Linux, Mac. In stationary wallets, private keys are stored in the computer on the hard drive, in order to use them, appropriate software must be installed. An example of a stationary wallet can be the Exodus wallet [13], which also has a mobile version.

Mobile Wallet: Mobile wallets are applications that can be installed on smartphones. They work well for users who use cryptocurrencies as a means of payment as they

give quick access wherever you are. An example of a mobile wallet is Trust Wallet [14].

Paper Wallet: A paper wallet is a private key printed on paper, usually with a QR code. Private keys are stored offline, making cryptocurrencies safer from cyberattacks, malware, etc. Figure 1 shows an example of a paper wallet.

Figure 1: An example of an Etherum paper wallet.

Hardware Wallet: Hardware wallets are physical electronic devices designed to safely store cryptocurrencies. They use a random number generator to generate public and private keys. The keys are stored on a device that is not connected to the Internet. These wallets are considered to be one of the safest options for storing cryptocurrencies. In order to carry out transactions with the use of this wallet, it must be connected to a computer or a smartphone. An example of a hardware wallet is Ledger [15].

Web Wallet: Web wallets are tools that can be accessed through various web browsers such as Google Chrome, Firefox, Brave, Edge. There are two types of online wallets that can be accessed through a website and those that are installed through a browser plug-in, where the keys are stored on the computer. An example of a hardware wallet is MetaMask [16].

3.1.   Surveys

The survey was aimed at collecting and checking basic information about the users preferences regarding the cryptocurrency management tool they use. In order to confirm the thesis and answer research questions, two-stage research was carried out. A survey and a cognitive walkthrough that both confirmed the thesis and answered research questions.

The study collected basic information about the respondents, such as age, gender, income and continent of residence. The data was collected in order to verify the profile of the study participants.

For the wallet which users chose as the one they use most often, they were asked questions: did they know what to do when they started using the tool, how they assess security and whether they feel safe when using the tool, assessment of the interface, understandability of the elements included in the tool, ease of using the wallet, is the tool offering a sufficiently large number of services/functions, are they satisfied with the tool, are they comfortable using the tool. The participants had to answer these questions on a scale of 1 to 10.

The questionnaire has been shared electronically. The surveys were sent via private messages to cryptocurrency users and users of cryptocurrency related

groups on social networks. The questionnaires were designed in Polish and translated into English in order to reach more respondents.

3.2. Cognitive walkthrough

There was a total of 5 people taking part in the cognitive walkthrough. All participants had the title of engineer and were students of the Lublin University of Technology at the Faculty of Electrical Engineering and Computer Science. For the purposes of the study, 4 main tasks were created, which were divided into 11 subtasks. With each task, participants had to answer standard yes or no questions and the number of errors made by the participant was counted.

In order to carry out the cognitive walkthrough study, the following tasks were selected.

Task 1. Set up the wallet.
　　1. Create a new account,
　　2. Find and save 12-24 word recovery phrase.
Task 2. Find address of the Litecoin cryptocurrency.
　　1. Find or add a cryptocurrency token, track it if needed,
　　2. Find a functionality option that allows you to receive a given cryptocurrency,
　　3. Find the address.
Task 3. Execute a transaction to the address provided.
　　1. Find a functionality option that allows you to send a given cryptocurrency,
　　2. Enter the recipient's address,
　　3. Enter the quantity,
　　4. Find the confirm button.
Task 4. Recover the wallet after loss (In-app option or must be installed).
　　1. Find the appropriate restore option,
　　2. Insert 12-24 word recovery phrase.

Five questions were asked for each subtask. For each subtask, you had to answer "yes" or "no". The total number of responses or steps for each tool was 55.

P1. Will the user understand how to start the task? (understanding that the action is needed)
P2. Is the action clearly visible?
P3. Will the user associate the correct action with the outcome they expect to achieve?
P4. If the task has been successfully completed, will the user see progress towards the intended outcome?
P5. Did the user successfully complete the task?

The tools selected for the study are those that are one of the most commonly used for storing multiple cryptocurrencies. The research was conducted for cryptocurrency management tools such as Coinbase Wallet, Trust Wallet, Exodus, Jaxx Liberty and Coinomi, all of these tools have mobile versions. The research was conducted on mobile versions of all tools.

Due to the global situation caused by COVID disease, the research was conducted electronically. Each participant was given 4 tasks to be performed. All participants performed tasks using the Android NoxPlayer emulator through the screen shared to them. Their activities were monitored and any possible comments were noted. The monitoring consisted in asking participants to express their impressions aloud on an ongoing basis while performing the task. The person conducting the experiment did not interfere in the tasks performed by the participants of the study.

4.　Results

4.1.　Survey

In the survey, after removing incorrectly completed questionnaires, 41 responses were finally obtained, of which the largest group of respondents were people aged 20-30. The exact age of the users was not collected, only the age ranges in which the respondents are located. Figure 2 shows which types of wallets are used by the respondents. Most of the respondents (75.61%) use a cryptocurrency wallet on a mobile device. Tools for stationary devices are used by 56.10% of the respondents. None of the respondents use the paper wallet solution. A small proportion of respondents (12.20%) use special hardware devices to access cryptocurrencies. Less than half of the respondents (43.90%) declared that they use the browser portfolio.
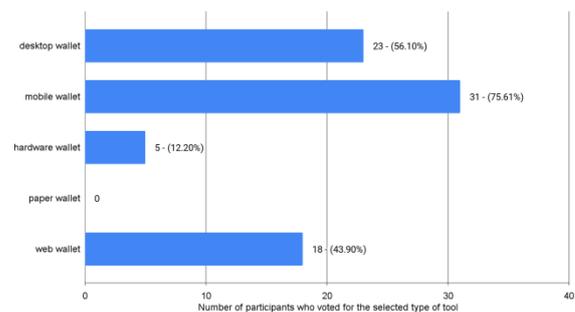

Figure 2: Bar chart showing the number of participants and the percentage of all participants who use a given type of wallet.

Figure 3 presents answers to the question which tools the respondents use most often. The survey participants most often chose the Trust Wallet tool, which was indicated by 29.30% of the respondents. In second place are three tools: MetaMask, Exodus, and Coinbase Wallet, each of them by 14.60% of respondents.
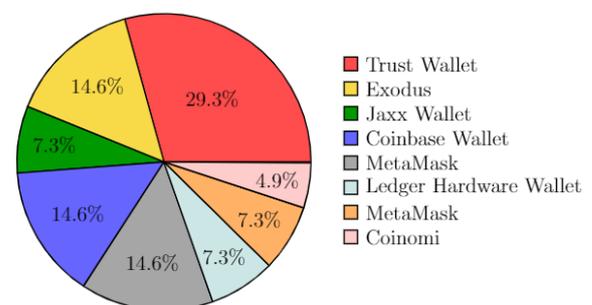

Figure 3: Pie chart showing the tool most respondents use.

For the tools selected in the question presented in Figure 3, users were asked about their impressions about the portfolio, its interface, security, and transpar-

ency. On the basis of the obtained results, the users, when assessing the level of safety and sense of security, gave most of the tools an average above 8 on a scale from 1 to 10.

It can be concluded that users feel safe using these solutions. In terms of safety, the worst tools was Exodus and MetaMask, with an average score of around 6.5 points (see Table 1). The results show that the respondents considered the Jaxx Liberty wallet as not having enough functionality, as it achieved an average of 5 points. Most of the tools in terms of assessing functionality or services received an average score of around 7 points. In terms of satisfaction, the Trust Wallet achieved the highest average. When assessing the comfort of using the application, the Trust Wallet and Coinomi tools were the best.

Of all the tools, Trust Wallet and Atomic Wallet performed best, having one of the highest averages of all the questions.

Table 1: User ratings for wallet questions on 10 point scale

Question / Tool	Trust Wallet	Coinomi	Atomic	Jaxx Liberty	MetaMask	Coinbase Wallet	Exodus
	Mean						
Did you know what to do when you started using your cryptocurrency wallet?	7.75	9.00	7.00	4.33	4.67	6.00	5.50
How do you rate the security level of the cryptocurrency management tool?	8.25	10.00	8.67	8.33	6.67	8.17	6.50
Do you feel safe when using a cryptocurrency wallet?	8.58	9.50	9.00	7.33	6.67	8.17	6.00
How do you rate the interface of the cryptocurrency management tool?	8.17	9.00	9.00	6.67	5.50	8.00	7.50
How do you rate the understandability of the elements contained in the cryptocurrency wallet? (do the elements have a specific purpose)	7.83	8.50	8.67	6.33	5.83	7.50	6.67
How do you rate the ease of use of the wallet?	8.25	9.50	8.33	6.67	6.83	6.67	8.17
Do you think the wallet offers enough services / features?	7.67	9.50	7.67	5.00	7.17	7.33	6.67
How satisfied are you with your wallet?	8.33	7.50	8.00	6.67	7.17	8.00	7.00
Do you feel comfortable using the application?	8.75	10.00	7.67	7.67	7.33	7.00	7.00

4.2. Cognitive walkthrough

The total number of failed steps for each tool is shown in Table 2. The table also shows the average number of failed steps committed by all participants out of 55 steps

and their percentage. In each tool, at least one user has taken one failed step.

The users of the Coinomi tool faced the most problems. Most of the users reported having trouble with finding the option to restore the wallet. There were also problems finding the send and receive functionality, participants reported that they were not visible enough. The problematic functionality of sending and receiving is shown in Figure 4.

Mobile versions of selected tools were tested in the study. Each of the tools achieved a result of over 90% of correctly performed tasks.
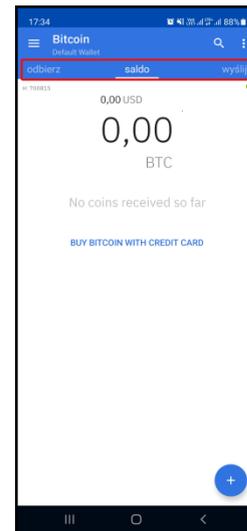

Figure 4: Faintly visible receive and send buttons in the Coinomi.

Table 2: Failed steps of the participants for each tool

Participant	P1	P2	P3	P4	P5	Avg. number of incorrect steps	Percentage of incorrect steps
Coinbase Wallet	0	0	1	0	0	0.2	0.36%
Trust Wallet	0	1	2	2	1	1.2	2.18%
Atomic Wallet	0	0	1	0	0	0.2	0.36%
Exodus	0	0	1	0	0	0.2	0.36%
Jaxx Liberty	2	0	0	2	2	1.2	2.18%
Coinomi	1	3	1	2	2	1.8	3.27%

All study participants were asked to choose two tools that they rated best after the study. Table 3 shows the tools chosen by each participant. The most votes were obtained by the Exodus, which obtained 5 votes, followed by the Trust Wallet, which received 4 votes from users, and the Coinbase Wallet tool with one vote.

Table 3: Two tools selected by each participant

Participant	Selected wallets	
1	Trust Wallet	Exodus
2	Coinbase Wallet	Exodus
3	Trust Wallet	Exodus
4	Exodus	Trust Wallet
5	Trust Wallet	Exodus

5. Conclusions

The main focus of the present research was put on determining which tool is currently the best solution for holding cryptocurrency. This analysis was carried out on the basis of surveys that were carried out among users of cryptocurrencies and the cognitive walkthrough.

The conducted research allowed to confirm the thesis and answer the research hypotheses.

One of the hypotheses was whether Trust Wallet is the most popular tool among users. After analyzing the survey, it can be concluded that it is one of the most popular tools because the largest number of respondents chose this tool as the one they use most often.

Another hypothesis was whether the Trust Wallet has the best functionalities according to the opinion of the users. When analyzing the survey, it can be noticed that Trust Wallet users gave a high rating in terms of the functionality offered by Trust Wallet, only Coinomi got a higher rating, but this may be due to the small number of respondents who chose the Coinomi tool.

The third research hypothesis was whether the user interface of the Trust Wallet tool is rated as useful. In the survey, the Trust Wallet tool performed very well, most of the users ratings were above the average of 7.5 points. The Cognitive Walkthrough study showed minor imperfections in the interface, but the overall result of correctly performed steps was 97.82%, which was not the best result that was obtained in the study. Additionally, the participants of the cognitive walkthrough, when asked which tool seemed to be the best for them, chose the Trust Wallet tool in second place. The Exodus tool was ranked first, with a majority of 1 vote.

The research was limited due to the small research group in the case of the questionnaires. More experienced cryptocurrency users generally want to remain anonymous in the decentralized world of cryptocurrencies, which may be the reason for a small research group. In the future, based on the data collected in the questionnaires, it is possible to conduct an in-depth analysis of the collected data.

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