Blockchain in Personal Document Archiving Services

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***Abstract*—In this article, blockchain technology is proposed for use in the personal document archiving process. This area is less covered in the literature/specialist applications in the field. The aim was to obtain benefits in terms of security, privacy and accessibility of personal data. The architecture of such a system is debated/justified to determine the justification of the importance of applying this research to the implementation of a: digital identity platform; personal health management system; digital portfolio of education and qualifications; financial identity management system; archiving of legal documents; blockchain for wills and estate planning; intellectual property management system; platforms for managing insurance documents; professional career management system; platforms for travel and immigration documents; And so on**

Keywords— Blockchain, personal archive, Post-custodial archive, virtual archive, trustworthy, Consortium Block Chain

I. INTRODUCTION

More and more it is necessary to need certain data from personal documents obtained over time to be able to provide further requested personal data. In other words, a personal archive made in time is necessary to support a person in need by shortening the search time, or the worst is to forget certain things that could affect the state of health, employability, educational documents, goods, etc. acquired by a person during his life.

The services and the collection of digital artifacts form the archiving system. [1] A digital artefact in the present case is a database of the achievements of a person who owns documents, other goods for which he is the owner. data that can uniquely identify a person (education, experience in a field, personal investments, diplomas, transcripts, etc.).

Blockchain technology in archiving personal documents can be used for:

- Developing a platform that allows individuals to store and manage their identity documents, such as passports, birth certificates and other relevant documents;
- A secure way to store and manage financial documents, such as tax returns and bank statements – e-wallet;
- Safe storage and management of patients' medical files, ensuring confidentiality and authorized access to health information;
- To issue and verify academic and professional certificates, such as diplomas and licenses, to prevent their forgery and fraud;
- Storing and managing invoices, receipts and other financial documents could simplify accounting and auditing processes and reduce the risk of document loss or falsification;
- Facilitates the registration and transfer of real estate property, ensuring transparency and authenticity of property documents;
- Store and manage insurance policies, policies and other relevant documents, facilitating claims and compensation processes;
- Smart contract storage and management could automate and simplify contract processes, ensuring compliance and automatic execution of contract clauses;
- Register and manage copyright for creative works such as texts, images and audio files, ensuring transparency and copyright protection;
- Storing and managing wills and inheritances, ensuring the correct distribution of assets and property in accordance with the wishes of the deceased.

The objective underlying this research is the analysis of the possibility and the proposal of an architecture for the management of archiving services of personal documents with high security and easy use in any situation.

The work is structured as follows: section II is a review of related literature; technologies, materials and methods are presented in section III; in section IV the architecture of the researched system is proposed; the operating algorithm and the results can be found in section V; the work ends with conclusions and future development directions.

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II. Review of Related Literature

Although it is a useful research topic for each of us, it has not been intensively addressed until now. This proves the novelty of the theme in the research sphere. This can be demonstrated by conducting a synthetic review of existing research.

The way an archive management architecture works by using the blockchain can be found in the research from [1]. It is a way to manage and keep certain defining elements of a persona safe.

In [2], the blockchain is used to allow the saving of refugees' documents, so that they can prove their belonging and their property, even if their country of origin tries to destroy all their supporting documents.

The authors in [3] propose the use of digital technologies for the purpose of recording courses that include new existing technologies in supporting the online system at the University of South Africa.

[4] provides the framework for creating a digital library using p2p and blockchain. Books in digital format are stored on personal computers all over the globe, the transfer being made through p2p technologies. The data is stored and protected with blockchain. In this way, copyrights are also protected, taxes are tracked, etc.

[5] uses blockchain technology to find interspersed conversations between a robot and a physical person in social media. The research aims to identify a person versus a social robot in a conversation. The application is called Personal Archive Service System (PASS).

[6] presents a way in which a bank can securely store information on a person regarding the bank accounts held. In this way, with blockchain technology, a series of manual operations can be automated. It is proposed to create a chain of blocks inside the bank. In this way, a customer can supervise an account that is more delicate, while the bank consequently holds the records (see table 1).

TABLE I. Centalized Reviewed Literature

Ref. no.	Objectives / Scope	Technology	Applications and solutions discussed
[1]	Demonstrating the belonging of some things to a person.	Blockchain	The research gives a solution for managing the personal portfolio and services.
[2]	Pilot implementation of the Rohingya Archive (R-Archive)	Blockchain	The application allows the refugee population of a region to be able to justify belonging to a state community, together with supporting documents referring to the person. The study is conducted for refugees from Burma.
[3]	It follows international trends and practices in the management of digital records, for online university education, for the transmission of information taking into account the evolution of technologies.	Digital technologies; record management	Solutions for students to know and use the processing, analysis, storage, long-term preservation and access of digital records. Solutions for students to know and use the processing, analysis, storage, long-term preservation and access of digital records.
[4]	The transformation of a physical library into one that can be consulted online.	Blockchain, P2P	The solution for storing and transmitting the content of information from books in a different way than consulting materials in a library.
[5]	Identification of conversational robots.	Blockchain	Detection of a robot and not a physical person from social media.
[6]	Creating chains with the information of a bank's customers.	Blockchain	For data security, the application of blockchain technology is used.

The bibliometric analysis was carried out on the most important international databases. Thus the following results were obtained:

A. *Web of Sience*

In order for the systemic review to be carried out as close as possible to the research topic, we conducted the search using various query keys as follows:

1) Data bases, archives personal: the analyzed period is between 2014 - February 2024. A number of 562 publications were found, which recorded a total number of 6199 citations, the evolution over the years can be visualized in Fig. 1.

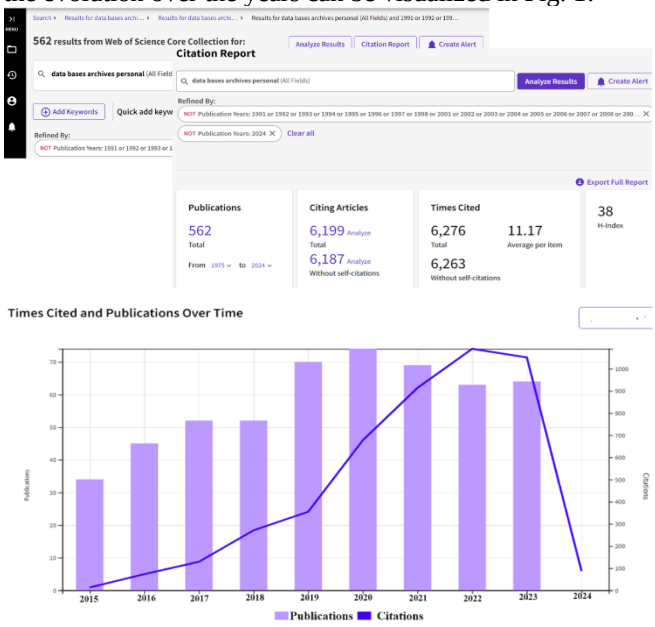
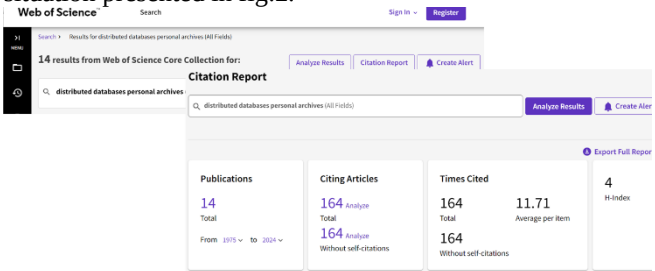


Fig. 1. Analysis of the Web of Science database - citations 2014-2024

2) Distributed databases, personal archives: in order for the number of research found to be relatively higher, a larger period was selected, 1998-2023, resulting in a number of 14 publications with 164 citations according to the following situation presented in fig.2.



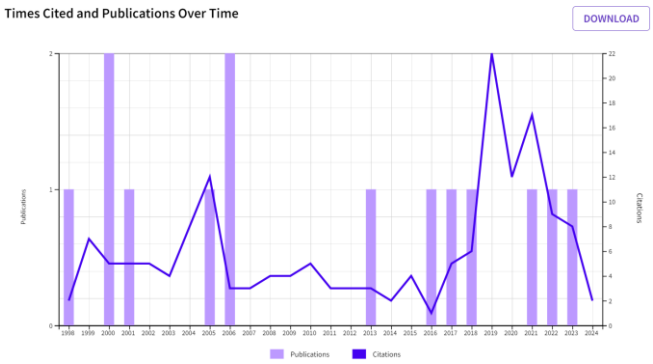


Fig. 2. Analysis of the Web of Science database - citations 1998-2023

*3) Personal archives, blockchain:*see fig. 3

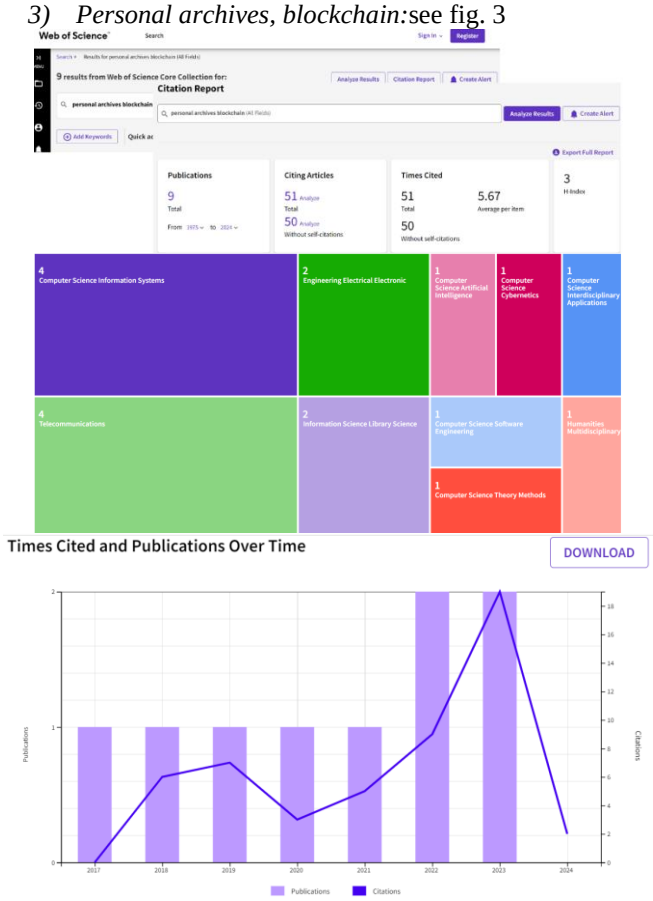
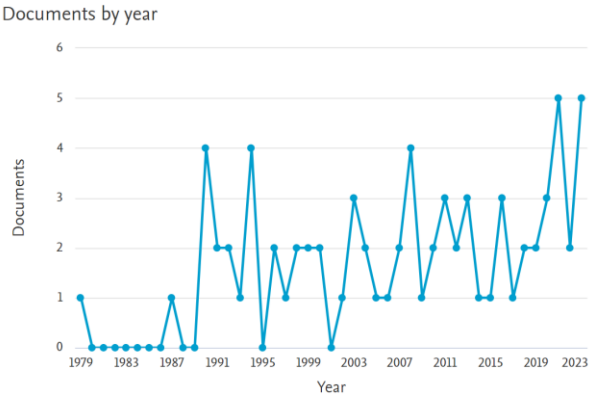


Fig. 3. Analysis of the Web of Science database - citations 2017-2023

B. Scopus

1) TITLE-ABS

KEY (data AND bases, AND archives AND personal) see fig. 4



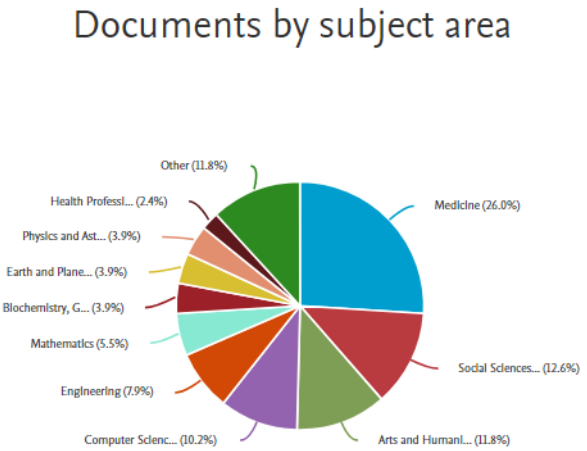


Fig. 4. Scopus TITLE-ANS

2) Distributed databases, personal arhives – no data found.

3) Personal archives, blockchain: TITLE-ABS-KEY (personal AND archives, AND blockchain) – see fig. 5

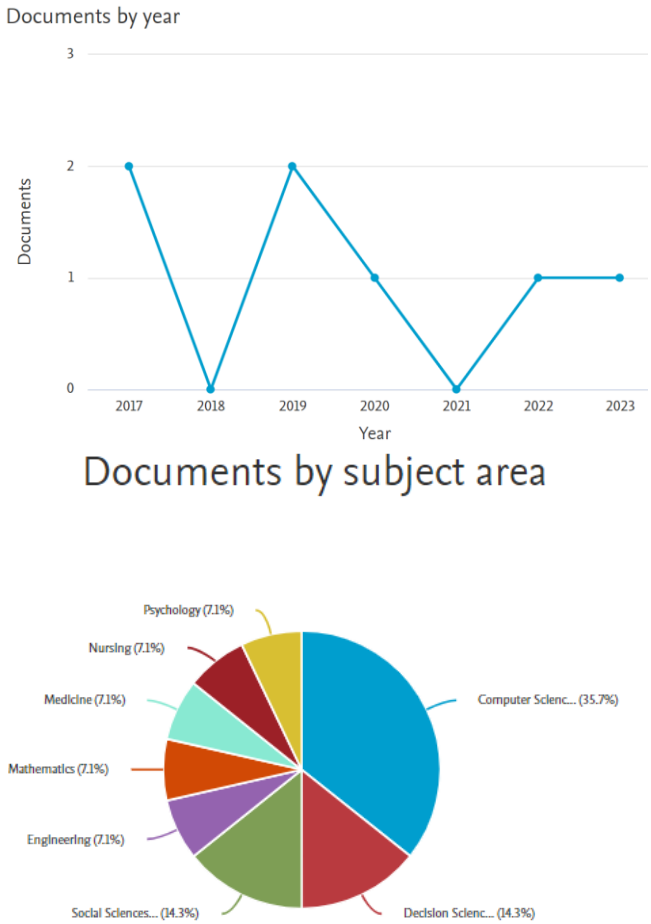


Fig. 5. Personal archives, blockchain

III. Technologies, Materials and Methods

The technology used to ensure increased data security is the one that uses distributed databases, namely blockchain. The role of blockchain technology is to share data with the entities found in the group. The data contained can be shared

for transaction using blockchain cloud services. This data is grouped into encrypted hashes.
The data can be modified only with the consent of the owner. Organizations and other partners can join the system, but the data can only be accessed by consensus.

Blockchain is used in this context for a number of ways such as: authenticity, immutability and safety, identity management, confidentiality, cost reduction and efficiency, transparency and auditability.
The study uses:

1) Public blockchain - with such a network, the owner offers access to basic data such as those contained in a CV.

2) Blockchain with permissions or private - the owner offers access to a limited number of organizations depending on the requirements.

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1) Public blockchain - with such a network, the owner offers access to basic data such as those contained in a CV.

2) Blockchain with permissions or private - the owner offers access to a limited number of organizations depending on the requirements.
Such as:

a) The owner of the archive wants to join an organization. But she wants to know the educational and professional course of the person. So the owner of the archive will have to allow access to this data. In this way, the organization has access to this information and is sure of the authenticity of the data, as it is no longer necessary to ask for confirmation from an educational unit, for example.

b) The person wants to go to some medical investigations. In this medical case, you will have to consult the person's medical file. The patient gives permanent access permission to the doctor or to a trusted person from the ownership of the owner of the medical archive.

c) The same system applies to all types of documents that are stored in the personal archive - the archiving services of personal property ownership documents.

3) Distributed or consortium Bockchain - in this case, right from the start, interested parties can be selected to have access to the data. For example, in the case of elderly people who need supervision, they offer access to a person or group of people who can have access to information.

IV. Architecture of the Proposed System

A series of factors concretized by data, facts and evidence compete in the creation of such a system.

Such a system consists of:

A. Proof of a person's qualification

The database that incorporates data regarding the qualifications of a person certified by diplomas (education, transcripts, pre-university and university diplomas, training certificates, experience, etc. It is similar to a CV of the person in which the course of formation of a personae). The difference between the CV and this data collection lies in the fact that the CV contains brief data due to limited space, while the database is a large repository. It should not be forgotten that these documents must bear the stamp of an authorized institution. To these is added the personal wealth accompanied by the values of each property, investments, bank accounts, etc.

B. Authentication of a person's name change

When changing the person's identification documents over time, personal biometric measures, information known only to the person who owns the database, physical objects of the person.

C. Medical history

Database with medial history of people (physical, dental, various interventions, medication, etc.) [7, 9]

D. Property documents, contracts, invoices, etc.

The database with the evidential archive of personal patrimony and the tracking of contracts/invoices related to a person.

Discussions - problems that may arise:

a) In case A: such a database created will allow a shortening of the physical consumption and the time of certification of the documents and respectively of searching in the large archives of the requested documents and data. In this way, the data is centralized and can be identified quickly and safely. For example, a person wants to be employed in a certain company. When hiring, the person needs the diplomas to justify the training. The person can present the diplomas physically, but the company must verify the authenticity of the documents. In the case of a higher education diploma, the issuing university will have to certify the authenticity. Considering the problems with fake diplomas, it can be said that the best method is for them to be issued both physically, as is the case, but also electronically, using a distributed database as security. It is easy to understand that all these things would require a lot of physical effort and time. In time, however, this process is not singular. It can be repeated every time a person submits an application. [2]

b) Case B: regarding the change of name in identity documents. This can only be followed if a person alone declares the name he used before using another name. If these changes are not known, obviously the correct path of a person cannot be known. It is quite difficult to identify this.

c) Case C: in the case of storing in the database the values that come from medical investigations of any kind, results, related medication and results/effects obtained. All these data will be accompanied by the specification of the location where the investigations are carried out, the doctor in charge of the case, etc.

To a personal archive, in addition to those shown above, many more data owned and customized by each individual can be added.

With regard to data access, the owners or any other entity to which the owner provides access to the interested data segment may have access to this stored personal data.

In this sense, an example can be given:

- an employer needs to receive justifications regarding the certification of a person's studies [8] that can be found in a CV;
- a doctor needs to view the medical history of the person who in this case is the patient;
- an employer wants to check and know the evolution of a person during the period when he had another name and what it was;
- a certain entity wants to know the property deed with the data certified as correct of a property, in order to

establish the eligibility for the approval of some actions;

- storing data regarding the contracts and invoices that a person owns - tracking the status of their progress / payments;
- etc.

Every person who wants to create such an archive of personal documents will have the data stored on chained blocks, and access will be possible either from the computer or from the phone depending on the options the owner wants - that is, the access can be public or private. A general scheme of the architecture can be found in figure 6.

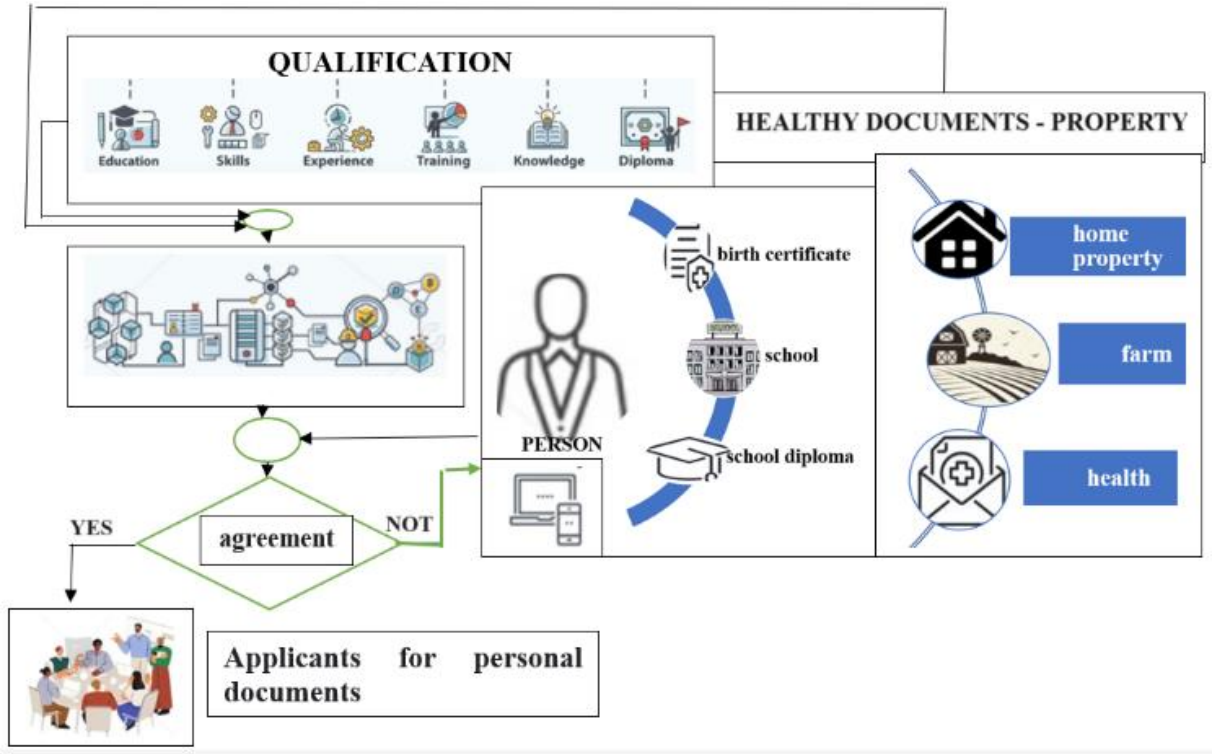

Fig. 6. Architecture of the proposed system

V. RESULT

Some of the results obtained from the partial testing of this platform are illustrated below.

The first page (fig. 7) represents the registration within the document storage system of a user.

The text fields are necessary to collect the necessary information.

The following text fields are presented:

ID: It represents the user's identification code and is automatically generated by the system;

Name: This field represents the user's name;

Password: This field illustrates the password set by the user of the data storage system;

Birth-date: It is the date of birth of the user;

PhoneNumber: Represents the user's phone number.

Address: It is the field intended for completing the home address of the user;

The text fields can be edited even after registration in the system.

The second page (fig. 8) of the user registration process represents the addition of more data.

The following text fields are presented:

Report ID: This text field represents the identification code of the report created for providing registration data and uploading information into the system;

Weight: It is intended to complement the user's weight;

Height: It is the field intended for the height of the user;

Notes: This field is intended for adding notes;

Blood Group: It is the blood group of the user;

Expiration date of the identify card: It is the field intended to alert the user about the expiration date of the identity card. The user receives a message on the phone and warns him 3 days before when the identity card is about to expire;

Additional Information: This text field is intended for adding additional information that the user wants to upload to the system;

Choose Files: This is a button that opens the interface for adding any type of document in the system.

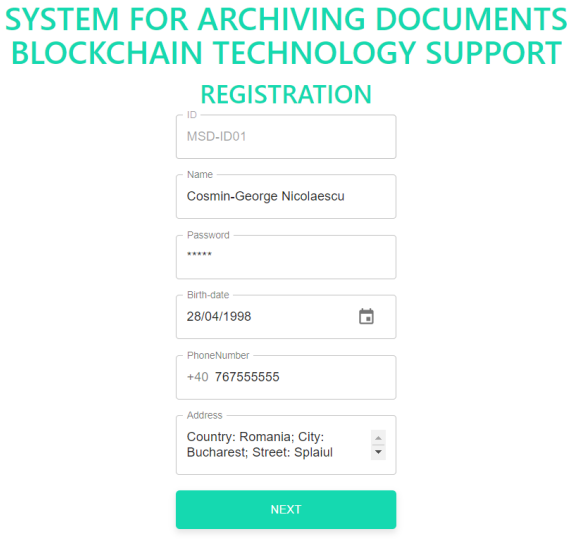

Fig. 7. Registration of the person in the system

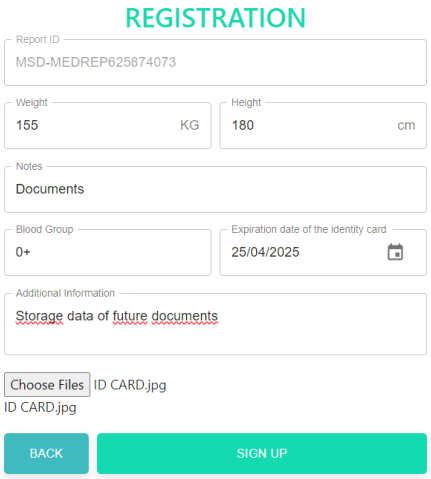

Fig. 8. Adding data to the page

All types of documents are accepted for their storage and for their centralization for easy finding.

This figure 9 illustrates a type of document that a user can upload in the dedicated section.

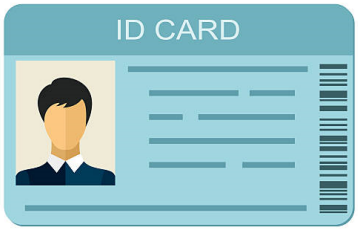

Fig. 9. Example of a document that can be loaded into the system

This image (fig. 10) shows the storage interface that is only visible to the user. The information is placed in the table for the delimitation and easy finding of the data that a user wants to view.

VI. Conclusions and Future Development Directions

A significant contribution consists in the fact that the main emphasis is placed on the use of blockchain technology in order to reduce the time allocated for quickly obtaining information. but also of the physical damage of the people involved. This technology applied in the archiving of personal documents, has been approached little or even not at all in the research so far in the specialized literature and here.

Blockchain enables security, privacy and accessibility while providing an efficient way to manage sensitive information. Blockchain technology is revolutionizing the way personal documents are stored, managed and shared in a secure and efficient way.

Blockchain implementation in personal real estate document archiving services may also face certain challenges, such as compatibility with existing infrastructure, general adoption, and specific real estate regulations. Overall, however, blockchain technology promises to revolutionize the way real estate is registered, transferred and managed, bringing significant benefits to everyone involved in the real estate transaction and administration process.

The potential to bring numerous advantages, including transparency, security, efficiency and fraud reduction. However, it is also important to consider issues related to regulation, interoperability and the overall adoption of technology in the real estate industry.

Blockchain in personal real estate document archiving services can bring multiple advantages: Data Security and Integrity, Fraud and Forgery Reduction, Transparency and Accessibility, Process Efficiency, Fast Property Verification and Authentication.

Blockchain technology promises to significantly improve the efficiency and security of real estate transactions.

As future development directions - writing a project that can be expanded and developed in the future. In the future, the gearing of Artificial Intelligence is also required.

STORAGE OF DATA AND DOCUMENTS IN THE PERSONAL ARCHIVE

No.	Name	Birth Date	Phone Number	Address	Weight	Height	Blood type	Notes	Description	Expiration date of the identify card	Documents loaded into the system
1	Cosmin-George Nicolaescu	28/4/1998 26 years	767555555	Country: Romania; City: Bucharest; Street: Splaiul Independentei;	155	180	0+	Documents	Storage data of future documents	25/4/2025 1 years	OPEN THE DOCUMENTS

Fig. 10. Database

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