

Smart Innovation, Systems and Technologies 280

José Luís Reis
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Marketing and Smart Technologies

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Zorica Bogdanović
Editors

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Preface

This book is composed of the papers written and accepted for presentation and discussion at the 2021 International Conference on Marketing and Technologies (ICMarkTech'21). This conference had the support of the University of La Laguna. It took place at Tenerife, Spain, during 2–4, 2021.

The 2021 International Conference on Marketing and Technologies (ICMarkTech'21) is an international forum for researchers and professionals to present and discuss the latest innovations, trends, results, experiences and concerns in the various fields of marketing and technologies related to it.

The program committee of ICMarkTech'21 was composed of a multidisciplinary group of 285 experts and those who are intimately concerned with marketing and technologies. They have had the responsibility for evaluating, in a 'double-blind review' process, the papers received for each of the main themes proposed for the conference: (A) Artificial Intelligence Applied in Marketing; (B) Virtual and Augmented Reality in Marketing; (C) Business Intelligence Databases and Marketing; (D) Data Mining and Big Data-Marketing Data Science; (E) Web Marketing, e-Commerce and v-Commerce; (F) Social Media and Networking; (G) Omnichannel and Marketing Communication; (H) Marketing, Geomarketing and IoT; (I) Marketing Automation and Marketing Inbound; (J) Machine Learning Applied to Marketing; (K) Customer Data Management and CRM; (L) Neuromarketing Technologies; (M) Mobile Marketing and Wearable Technologies; (N) Gamification Technologies to Marketing; (O) Blockchain Applied to Marketing; (P) Technologies Applied to Tourism Marketing; (Q) Digital Marketing and Branding; (R) Innovative Business Models and Applications for Smart Cities.

ICMarkTech'21 received about 200 contributions from 30 countries around the world. The papers accepted for presentation and discussion at the conference are published by Springer (this book, volume 1 and volume 2) and will be submitted for indexing by ISI, EI-Compendex, SCOPUS, DBLP and/or Google Scholar, among others.

We acknowledge all of those that contributed to the staging of ICMarkTech'21 (authors, committees, workshop organizers and sponsors). We deeply appreciate their involvement and support that was crucial for the success of ICMarkTech'21.

Tenerife, Spain
December 2021

José Luís Reis
Marc K. Peter
Ricardo Cayolla
Zorica Bogdanović

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Blockchain Applied to Marketing

Marketing SeeLigg, a Private Electric Chargers Sharing Network



Alexandre Sousa, Renata Barbosa, Pedro Alexandre, and Bruno Nini

Abstract Two factors that slow down the switch to electric vehicles are the fear of losing autonomy due to limited coverage of the public electric charger network, and cross border compatibility of the cards used for payment of the electric charges. Many private entities deployed in-premises electric chargers to charge their vehicle fleet of one or more vehicles, these chargers are sometimes in places with public access and are part-time idle, thus could be used by others if there was a way to know when the charger was available for use and a straightforward way of making payments that ideally should work across country borders. Potential solutions to these problems have been implemented that take care of payment and availability information but they are limited in scope and usually do not work across borders. We propose SeeLigg, a blockchain-based solution that is marketed to the potential user's community as open and transparent, trying in this way to achieve critical mass for the network effect to kick-in and to become worthwhile being part of the SeeLigg community.

Keywords Blockchain applied to marketing · Blockchain applied to the energy market · Governance of blockchain networks · Network effect

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1 Introduction

We have a network effect when increasing the number of participants in a network improves the value of the good or service for all the participants in the network. When there are few users, being in the network is of little value for the current participants. Only when the number of participants reaches a critical level does it start to become more and more attractive to be a part of that network.

The SeeLigg project has as its goal to create a community (network) of electric vehicle users that can charge their vehicles using geographically distributed private vehicle chargers belonging to other participants in the community. This means that when its owner is not using the charger, that is the charger is idle, other participants in the network could use it to charge their vehicle assuming that the charger is located in a place that is accessible to the general public.

Developing such a project requires solving both technical issues (locate the nearest charger, see if it is available, pay for the energy spent charging the battery) and issues related with credibility and marketing the project to a set of users large enough to make it worthwhile belonging to the community.

The remaining of this paper is organized as follows. Section 2 discusses the slow but progressive path that is underway to a world full of Electric Vehicles. Section 3 describes the SeeLigg project. Section 4 presents the reasoning for choosing a peer-to-peer blockchain solution as the basis for the system of incentives and marketing of the project. Section 5 discusses issues related with the selection of Blockchain technology. Section 6 draws conclusions about the current results and proposes directions for further research.

2 The Road to Electric Vehicles

The Internal Combustion Engine (ICE) powered by liquid petrol or gas has the advantage that the vehicle is always available, as long as the fuel supply and the finances to purchase it are available. Assuming average consumption the fuel tank must be refilled after one to two weeks, and filling times are five to ten minutes. This must be compared with the much higher frequency and length of charging Electric Vehicles (EVs). Long charging times are particularly inconvenient when travelling long distances as they force drivers to stop frequently, after travelling around 300–500 km. Further, the drivers must wait while their vehicle charges [1].

A study made in 2013 for the French-German market showed that early EV adopters were likely to have a higher level of income, to have a household equipped with two or more cars and to travel more than 50 km a day, not necessarily by car [2]. At that time electric charging a vehicle outside of home was a significant endeavor.

Another study of BMW i3 customers showed that, as expected, they had a preoccupation with autonomy range, short charging time, hassle-free handling for charging, affordable prices, and cost effectiveness under a total cost of ownership's view. They

were looking for a charging infrastructure that left no doubts in terms of the next available charging station including enough fast-charging stations along the routes. The majority was living in an own house, as parking and charging at home at that time was almost mandatory [3].

The slow adoption of EVs is considered an instance of the social dilemma problem, where individuals in interdependent situations face choices in which the maximization of short-term self-interest yields outcomes leaving all participants worse off than feasible alternatives. The value of EV can be split into common value and private value. EV cars provide less negative common value than ICE cars (less noise and emissions) but have difficulties in providing the same amount of private value as the ICE car in terms of price, driving range, charging/refueling time, although they often manage to show a lower energy cost [4].

In the meantime, the situation has changed, now there is a significantly larger network of publicly available chargers although that network is still much smaller than the conventional fuel supply network, thus the problem is smaller but has not altogether disappeared.

The idea of sharing resources for improving this situation is not new. There are several peer-to-peer carsharing services [5], and other services that try to combine commercially available and privately owned electric chargers [6]. This is combined with other complementary concepts, such as Vehicle-to-Grid where the EV batteries are seen as a temporary energy storage device that could be fed back to the power grid when the vehicle is stationary [7, 8]; and OLEV (On Line Electric Vehicle), where the electric motor is powered by an underground power supply system, embedded in the road that generates a magnetic field above the ground for pickup by a unit mounted on the bottom of the vehicle, thus there is only the need for a small battery or capacitor for use in non-powered roads [9]. Several other possibilities and dimensions are currently being discussed [10].

There has been some controversy on whether the switch from fossil-fuel-based to electricity is actually reducing carbon emissions after we take into account the source of the electric energy. Still, this was shown to happen around the world even while electricity generation itself is not fully decarbonized, that is, in some instances the production of electricity itself is still using a significant amount of fossil-fuel [11].

3 The SeeLigg Project

To create a community for sharing private chargers and for that community to reach a size where the network effect kicks-in, the following issues must be solved:

1. Present an easy way to know the location (GPS coordinates), characteristics (fast or slow charger), and status of each charger in the network for a given date and time (idle, out of order, being used, reserved)
2. Present an easy way to pay for the energy used to charge the vehicle's battery

3. Provide guarantees that a given charger can be reserved for a given time period and will be available at that time
4. Provide the ability to adapt to changing circumstances, e.g., to be notified that in the meantime the charger that was reserved broke down and an alternative should be chosen
5. Provide one or more incentives to choose this community over other competing communities or other competing solutions that are not compatible with this one, and as such to walk towards achieving the network effect.

The first issue is solved by creating a device (a SeeLigg gateway) to be placed between the charger and the mains power supply, that can be activated by an App in the user's smartphone. The goal of the promoters of this project is to create a sharing platform, not to sell SeeLigg gateways. As such a sample gateway was created, and the goal is to publish the specification of that gateway so that anyone can buy such a gateway from one of the project partners or build their own. The gateway must be cheap enough (e.g., around 50 euros) to be an interesting buy for people that want to participate in the network and that have a charger that they want to add to the network. Using public-key cryptography each gateway must be certified and authorized in a way similar to the Public Key Infrastructure used to validate digital signatures. Notice that it is possible for electric vehicle owners to use the chargers in the network without owning a charger, or without making their charger(s) available to the network.

In some countries there is a regulated process, that can vary depending on the country, to become a registered owner of public chargers and as such a reseller of energy. The goal of this project is to stay away from that situation. The participants that add a charger to the network are doing that in a private manner, they are only sharing their charger and expect to be adequately compensated, according to the rules of the network. The rules are simple, the energy price should be the real energy price (that usually varies with the time of the day), plus an overhead to be paid to the charger owner to amortize the cost of the gateway (it disappears as soon as it is assumed that cost was fully amortized), plus a small availability fee to be permanently paid to the charger owner, plus a small fee to amortize and adequately compensate the project promoters and initial participants in the network, plus a small fee to cover the maintenance costs of the sharing platform. For the project's success it is important that the final energy price after considering all these overheads is not too different from the real energy price. When the owner of a gateway uses the charger connected to that gateway the associated cost is zero, that is there are no overheads to be paid (he/she will only have to pay their normal energy bill).

To reduce transaction costs all payments are monthly settled through an offsetting procedure of the amounts due (for using chargers from other participants in the network) with the amounts owed (by the other users that used this user's charger). The user account balance must always be positive, that is, a charger can only be used if the account balance is enough for that usage. As the goal of this project is to give peace of mind (and better energy prices) to the community participants, and not making a business of selling energy, it is only when, and if, a given user wants to settle

a part or the total of their account that any positive balance is effectively paid to that user. Notice that the difference between the amount received and the corresponding real energy cost assumed to have been paid by that user can be a taxable revenue.

There are competing solutions, in Portugal there is, e.g. [12]. As such, for this project to work, and expand until it reaches critical mass for the network effect from then on to push it forward, it is necessary to have incentives to attract enough early adopters. Thus, the system of incentives and marketing of this project must be such that allows it to be distinguishable from the competition.

4 Achieving and Maintaining the Network Effect

The main difficulty of creating a sharing platform is not technical, it is the need to attract enough users. The SeeLigg platform does not own a single charger, it only facilitates the sharing of chargers between the platform users. As such, if there are too few users, or if they are all near the same location, then there is no advantage in using the platform.

It would be possible to try to keep away the competition by just offering an App with a better user experience or by offering better energy prices. The problem with this approach is that the competition will react, improving their App and reducing their prices. And at the same time some solutions are already in the market, thus for the time being they have the advantage of already having a community of users.

What the competing solutions usually do not have, is a fully transparent price policy and do not provide guarantees about the future prices charged for using their platform. For that reason, SeeLigg is adopting a blockchain-based solution, hoping to use that as a marketing advantage that could propel SeeLigg to increase its number of users. Blockchain solutions are already being adopted at several levels of the energy market [13], using it in a charging network is just one of its possible uses [6].

A blockchain is an immutable distributed ledger, each node in the blockchain network contains a full copy of the blockchain. The blockchain consists of a linked list of blocks where each block contains a validation code that depends on the contents of the previous block in the chain. In this way changing any block in the chain would be easily detected and refused by the majority of the participants in the network. A blockchain needs a security mechanism that makes the validation codes difficult to evaluate, and being a distributed ledger some form of consensus mechanism must be used.

In general a public blockchain has three ingredients: (1) a public distributed (multiple copies) ledger which contents are agreed upon by a majority of the participants in the network; (2) a consensus algorithm used to ensure that a majority of the copies of the ledger are the same; (3) a currency, that is a digital token that has value and is publicly traded, that is used to align the incentives of everyone involved.

The cryptocurrency Bitcoin [14], although it did not invent the concept of a blockchain (nor called it by that name), represents the first time that such a set

of ingredients were assembled in such an innovative way that brought us the cryptocurrency and blockchain revolution [15]. Still a missing ingredient was needed, the ability to run Smart Contracts. The concept of a Smart Contract had been invented in 1997 [16], the first cryptocurrency to integrate a scripting language that allows the creation of smart contracts supported by the blockchain was Ethereum [17]. The platform allows anyone to deploy permanent and immutable decentralized applications (Smart Contracts) onto it.

The importance of using smart contracts in SeeLigg is that once established and deployed in the network they take a life of their own. It is important to test them beforehand against errors and security issues, because once deployed even if they are found to be faulty there is no easy way to change them, except through the governance and evolution process implemented in the network. But if this makes the initial creation and testing of the smart contracts harder than in a normal online platform, at the same time it also brings assurances that other platforms cannot bring to the table.

In a way, the main incentive that users have to participate in the SeeLigg sharing platform is that not only the platform fees are fully documented but they are also automatically applied by the smart contracts that are executed without human intervention and without the possibility of human interference.

5 Discussion

The blockchain is used to run smart contracts that perform the operations of the platform, e.g., to add a new node (gateway) to the network; to pay for a charging operation; or to run the offsetting procedure that settles electric charges spent with electric charges owed. The fact that these operations are done within the context of smart contracts has the advantage that the operations become fully transparent. For privacy reasons the participants in the smart contract are represented by only a part of their public key.

Taking into consideration the environmental impact (in terms of energy spent) for running a proof-of-work consensus algorithm (e.g., bitcoin mining), we decided that SeeLigg needed to use a blockchain that used a proof-of-stake algorithm which is about two orders of magnitude cheaper in terms of energy spent. Ethereum is now in the process of moving from proof-of-work to proof-of-stake and as such was selected as the best candidate for supporting the SeeLigg network.

A proof-of-work algorithm such as the one used in Bitcoin is more robust than a proof-of-stake algorithm, but the later has the enormous advantage of being much more energy efficient. As of 2021 bitcoin mining is estimated to represent around 91 terawatts-hours per year. That amount represents more electricity than is used by several small countries, it almost reaches half per cent of all the energy consumed in the world and is seven times larger than the energy consumption of Google global operations [18]. A proof-of-stake algorithm has also the advantage that it is much

more democratic: a lower barrier to entry as there is no need to have high performance hardware in order to stand a chance of creating new blocks; more immune to centralization because it is likely that the blockchain network will have more nodes.

The SeeLigg gateway is already on its third iteration. The first version could be used to charge a small appliance. The second version was able to charge an electric vehicle, but the electric charger had to be opened and modified, thus invalidating its warranty. The third version does not need the charger to be modified. We are now working in the fourth version that includes public-key cryptography so that the gateway can be validated by the blockchain network. Once this is finished, we will publish its specification so that anyone can produce compatible gateways.

Marketing changes the sale of a product from a mere sale into something with value, concept, and purpose. Through marketing sales are transformed into acquisition of values and services that represent a statement about life choices and quality of life. We believe that some users can be brought to SeeLigg because they see the platform's approach in a positive light when compared to the solutions chosen by others. But for that to work the governance of the evolution of the SeeLigg network must be such that its users consider it a fair and democratic process. Kotler describes marketing as a social process, where individuals acquire what they need and want through the offerings, creations, and negotiations of valuable products and services [19]. In this case it is paramount convincing the network users of the fairness of the SeeLigg Smart Contracts, and convincing them that their voice will be heard when later on changes need to be brought into the network.

It is important to realize that the use of a blockchain is not just a marketing gimmick to try to ride the blockchain hype. It is a conscient option of releasing to the network some of the control on how the platform will be created and managed, that release of control makes the platform more complex and harder to implement, but at the same time increases its transparency and robustness. Once implemented and represented as a set of smart contracts, the platform becomes blind to the interests of any of its users (including its creators). The only way to change the smart contracts is by using the provisions set for their evolution, and that evolution is controlled by the democratic vote of the participants in the network, that is, it is controlled by the network governance. It is that increase in transparency and robustness that we hope will attract more users, not the use of the term blockchain. Thus, when we say that for us the use of a blockchain contributes to the marketing of SeeLigg we mean that we hope to attract users that want to participate in a community that is both transparent and robust and that like us believe that a blockchain and the use of smart contracts can help on that regard, because it reduces the need to trust the creators of the network.

The use of a blockchain and smart contracts allows us to eliminate some intermediaries, but it is not true that the use of a blockchain allows us to eliminate the need for trust. As Schneier [20] aptly identified, what a blockchain does is shift some of the trust in people and institutions into trust in technology. We still need to trust that the cryptography, the protocols, and the software are correctly implemented. As such, the use of a blockchain and smart contracts, although bringing transparency to an otherwise opaque digital platform, is not a silver bullet for the issue of security and

trust. Most of the network participants will not be able to analyze the open-source code of the smart contracts and decide whether it is correct, what they will do is trust that the few of them that are technically savvy to be able to do that, will do that verification for them.

6 Conclusion

The idea of creating an electric chargers sharing platform is not new. There are similar projects in different states of implementation. Still those projects had enough issues that convinced us to start implementing the SeeLigg platform as a way to benefit those of us that already use electric vehicles, and those of us that intend to start using them. It was the need to differentiate the SeeLigg platform from other competing platforms, and to market it as a more transparent and trustworthy solution, and thus to attract more users to this platform, that led us to include smart contracts (and by extension a blockchain) in the SeeLigg platform.

We are currently discussing how the governance of the SeeLigg network could be assigned to a DSAO (Decentralised Semi-Autonomous Organisation) [21]. At the same time, we are also evaluating contexts where other networks (e.g., a chain of hotels or a chain of fast food) could profit from installing SeeLigg compatible chargers in their premises so that people would choose to be there while waiting for their vehicles to finish charging.

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Application of Smart Contracts in Online Product Procurement



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Abstract In this work, a platform for the acquisition of online products is presented, where companies finally offer merchandise, so that users can buy from the comfort of their homes, taking into account that each of the parties will ensure compliance with the service. For this, the concept of smart contract is applied, which guarantees the correct execution of the agreement during the process, this based on blockchain technology, which provides confidence in the assurance of information.

Keywords Purchase · Products · Contract · Blockchain · Security · Technology

1 Introduction

Online shopping has become an excellent alternative for the growth of small, medium and large companies, emerging as a benefit of the expansion of the internet, allowing suppliers to be not only in the local or national market, but also in the international [1]. That is why, taking into account the advances in technology, a tool can be provided that supports both bidders and buyers in the acquisition of products that meet the requirements of each of the parties, thus giving a system that provides confidence and security in each of the transactions carried out for this purpose.

Blockchain as a distributed system in a network, allows to decentralize information and keep it in different nodes, where each of these is responsible for the

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data that they contain and those that will enter the chain, therefore, its main characteristics are security, integrity and transparency in the transactions executed within this technology [2]. The application of this tool has been seen in different areas such as finance, the judiciary and commerce [3], where it has also begun to venture into online sales, as solutions to concurrent problems are found that compromise the good commercial experience of all those involved, an aspect that is taken into account during the configuration of this project.

Smart contracts as computer protocols, aim to facilitate, verify and automatically ensure the negotiation between two untrustworthy parties [4], although smart contracts have made a space in several sectors, in trade they have provided a great help for example in high value transactions, where they must be very rigorous since they can have attacks on your security, and it is at this point where Ethereum makes its smart contracts with high levels of protection available for your transactions [5]. The vast majority of online sales have required a mediator between the customer and the seller, where many times the person, website or intermediary company, makes the effect of a broken phone and ends up giving erroneous information that causes prevention in those involved and lack of transparency in the process [6]. As a great effect of this problem, is that customers avoid buying online, since many times the product they asked for was not the one that arrived or perhaps they never received it, generating economic losses and distrust, making them prefer physical purchases.

In this project, a system is proposed that allows bidders to publish their merchandise, giving customers a series of descriptions and prices, so that they can choose and buy their desired products, this within the “regulatory-instrumentalist” idea that must have with the management of smart contracts, to ensure that the transaction is fulfilled by both the seller and the customer [7]. Although smart contracts are not easy to handle, [8] designs a platform that makes it easier for the vulnerable population to handle contracts with a high level of difficulty, making understanding and signing no more than a few clicks, this system provides a guide for our platform to simplify the management of smart contracts in the acquisition of goods.

The development of the system is based on the life cycle of smart contracts, which consists of four phases: Creation, freezing, execution and completion, which guarantee the integrity and adequate execution of the platform structure [9], where each of the phases allows the construction of an operational module.

2 Background

Blockchain technology is an innovative technology that in the midst of a competitive environment can be applied in different sectors of the economy, with the aim of creating a new generation of decentralized and disintermediated applications, in which the trust of those involved is placed in algorithms and not in a centralized organization [10]. Blockchain technology has been gaining great importance in different areas, including tourism, where through smart contracts, decentralized applications (DAPP) and cryptocurrencies, it has been slightly implemented. But despite the

importance of this tool, very few researchers have conducted usability studies within the tourism and travel industry [11].

Blockchain has had a big boost in shopping applications that have security in personal information, payments and income management [12]. Taking as an example, one of the implementations of this technology in the online shopping industry has been the sale of medical tourism plans, which occur when patients travel in search of better treatments than those provided in their place of origin. However, to acquire the services they need from intermediaries, they run the risk of being scammed and losing their investment, therefore, it is at this point where blockchain helps to increase disintermediation, transparency and trust, optimizing time and expenses, guaranteeing disbursement of payments and enforcing mutually accepted agreements [13].

Smart contracts are immutable documents once executed, so when there is a vulnerability or an error, they can cause great damage, therefore, to avoid inconveniences, developers are recommended to use fragments of algorithms already used for their new implementation [14]. It should be noted that not all “blockchains” allow the management of smart contracts since their use entails a high monetary cost [6]. The implementation of these is observed in many fields, but one in particular is patent management, where to guarantee the rights of a property, special lawyers have been used that were made obsolete by the use of smart contracts for the protection of intellectual property [15].

3 Application Modules

Taking into account the problem of intermediaries in the purchase of online products, in which the information runs the risk of being misrepresented, both for the offeror and for the client, a prototype is proposed for the implementation of smart contracts in the acquisition of merchandise, whose objective is to eliminate intermediation, as it is a direct channel between the main stakeholders. This platform consists of six modules: user registration and access, product loading, cart, cart verification, cart confirmation, shipment progress and audit.

The user registration and access module consist of a registration form where the user enters their personal data, their role within the platform, username and password, this will allow a more personalized navigation within the platform and store the data of their purchases, in turn, it also consists of an access form that will ask the client for their username and password. Product loading is a module available only for the roles of the bidding entities or persons, as they can load the product with its description and prices, culminating with the publication of this.

The cart is for the exclusive use of customers, there they can choose different products and mount their purchase, once completed it can be confirmed so that the execution of the contract begins on the stipulated dates. The verification of the cart is carried out by the service providers, in this module they will see all the carts assembled by the clients and will be able to verify the existence of stock, if the users

meet the requirements, among other parameters, once this review is completed, it will be given the go-ahead to start the execution of the contract. The confirmation of the cart is made by the customer once the entity has verified the existence of the products.

The shipment tracking can be viewed by both the bidder and the customer, there they will be able to see that the shipment has been made and that it is necessary, also if the stipulated times are being met. Finally, in the audit, a person with the role of auditor, will be able to review each of the transactions that are carried out within the platform, it should be noted that this module is the implementation of the “chain of blocks” through a P2P network. Once the auditor must sign the transactions to record them within the network in a block and thus maintain control of everything that is done in the system.

4 Database Model

The database is implemented in the PostgreSQL engine, thus being a relational type, which stores the data of the users, the activities of the plan, the contracts (transaction) and the participants of each of these contracts (Fig. 1).

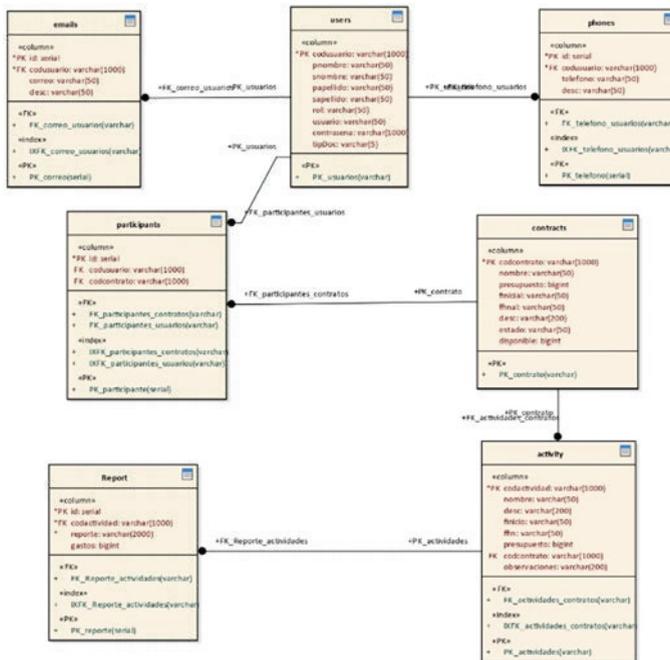


Fig. 1 Database model. Source Own elaboration

5 General System Requirements

The system must meet the following requirements for optimal functionality (Table 1).

6 Functional Model Based on Use Cases

Access to the Platform

See Fig. 2.

Offerer Actions

See Fig. 3.

Customer Actions

See Fig. 4.

7 Architecture

The architecture of the platform consists of a back-end made in the microframework of the Python flask, this offers the possibility of integrating a large number of libraries and consists of its own server, the front-end is the combination of HTML 5, CSS and JS, with helper components like Bootstrap and alertify js, the communication between these two parts is done via AJAX. Finally, the database is controlled by the PostgreSQL engine, connected to the back-end with the psycopg2 library (Fig. 5).

8 Component Diagram

The component architecture is centralized, where the central point is the application of smart contracts, there is the database administrator who is in charge of the connection with the database and the management of the information. Through the user administrator, all the functionalities with which users interact with the system are managed, and finally, the GUI provides views that facilitate interaction with the platform (Fig. 6).