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Blockchain Real Estate Relational Value Survey

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ABSTRACT

Relational capital for companies has been theorized and modeled in the past, but so far, no real Web application has tried to bring its value to light, especially concerning the real estate application domain. In this paper, we present the results of our surveys on how the types of relations who have contributed to a product impact price premium and what real estate agencies think about real estate relational value, especially as implemented on our Web marketplace connected to Facebook social network and NEO public blockchain for products certifications transparency.

CCS CONCEPTS

• **Networks** → Network types; *Online social networks*
• **Information systems** → World Wide Web; *Web applications*

KEYWORDS

Certifications, Blockchain, Relational Capital, Trust, Real estate

1 INTRODUCTION

Research on relational capital and social capital [1] hints that they are valuable for a company, but to the best of our knowledge, there is no online service that has tried to compute and exploit that hidden value. In this paper, we present our relational value marketplace and what real estate agencies think about it as captured by a survey that we carried out with them in July 2018. We also give an initial formula to compute relational value, and a Google Surveys answered by Americans provides an estimate of relational value

depending on the relational distance between the product buyer and the product contributors.

The next section discusses related work. In Section 3, we present how we have designed and implemented our relational value marketplace and applied it to real estate. In Section 4, we present the results of our surveys. Section 5 concludes our paper.

2 RELATED WORK

There has been a lot of theoretical work focusing on the concepts around social capital and relational capital [1]. Neilson et al. define relational capital as "the value of firm's network of relationships with its customers, suppliers, alliance partners and employees" [2]. Relational capital value is also dependent on the employees and suppliers locations that patriotic marketing brings to light [3], [4]. Surveys conducted in 2017 indicate that several populations are willing to pay more for products made in their home countries because it contributes to their fellow nationals more than a foreign product would: in an IFOP French adults survey [5], 74% declared that they would pay more for products made in France and 29% more than 10% price premium; in a ReportLinker USA adults survey, it was found that 57% of American consumers were willing to pay more for products made in the USA, among them 42% were prepared to pay 30% price premium and 81% to pay 15% more [6]. Smits et al. found that products with added responsible consumption information have an average weighted price premium of 20% [7]. A model to evaluate the relational capital of organizations has even been proposed [8]. However, no applied research has been carried out to evaluate that relational value, and there is no existing Web service trying to compute it. After remote services access via Web services [9] and peer-to-peer systems [10], blockchain [11] goes beyond peer-to-peer to bring stronger guarantees with regards to censorship-resistance, transparency, and no double-spending. LinkedIn is the best-known business social network. However, it doesn't compute the relational value of companies based on their listed employees. If LinkedIn would try to compute such relational value, it would have to first solve the trust issues in these listings of employees because no verification is done when someone adds a job position linked to a company listed on LinkedIn, which makes cheating too easy.

To be able to compute the relational value of a product, one must first analyze the product to know how many entities have contributed to its creation. Real estate product creation involves several types of actors: architects, plumbers, builders, electricians… One may also choose to include the entities that contributed to the materials. As each entity doesn't contribute to the same extent, their contribution share must then be estimated. In the real estate domain, although the share of contributions may vary depending on the type of real estate, others have estimated how much each part of a house costs on average [12], and we have used such estimation, e.g., the kitchen costs around 4% of the total price of a house.

The above definition of relational capital includes not only suppliers, alliance partners, employees, but also customers. Online ratings and reviews are more and more common [13], especially in the tourism industry with TripAdvisor. However, there is no equally well-known rating service in the real estate industry. Nevertheless, in this paper, we focus on the relational value brought by the people who have contributed to building the product.

3 REAL ESTATE RELATIONAL VALUE

In this section, we first formalize how we compute relational value and then how it has been applied to our relational marketplace in the real estate application domain.

3.1 Relational Value Computation

Let be N the set of n entities involved in the life-cycle process of a product from creation, selling to maintenance and recycling. Let be M, a subset of N, the set of $m \leq n$ entities that are known because some entities may not be known, e.g., we don't know the carpenter who has created the real estate wooden roof.

Let be d the relational distance between the potential customer/user u and one of the entities in N, a real number between [0,1]. That relational distance may be based on the geographical distance between the living place of these two persons, the fact that they live in the same country, or that they are part of the same family or friends of friends. If the relational distance cannot be computed, a default value of 1 for d may be used for all the entities in N.

Let be c the relative contribution of one of the entities in N as part of the overall lifecycle process of the product, a real number between [0,1]. For example, in the case of real estate, if the kitchen is realized by only one carpenter and based on the fact that a kitchen counts for around 4% of the price of a full house according to [12], c for the carpenter would be set to 0,04.

Let be R the relational value of a product, a real number between [0,100], which depends on the potential buyer, e.g., where she/he lives or her/his social network, computed according to the following formulas detailed in (1).

$$If\ m > 0, \qquad R = 100 \times \sum_{i=1}^{m} d_i \times c_i$$
$$else\ R = 0 \qquad\qquad (1)$$
$$\sum_{i=1}^{n} c_i = 1$$

Figure 1 depicts the results of such computation in the case of two chalet houses in the mountains. Only one contributor is known for the left chalet because only one photo is displayed in the list of photos of the contributors. In this case, it is the carpenter photo. In the next subsection, we explain that we have added the contributor's photos and extra information about them in our Web marketplace implementation to influence further the potential customers to choose the products with the highest relational value. The right chalet, on the other hand, has a higher relational value because three contributors are known, not only the carpenter but also the plumber and wall builder.

Figure 1: Real estate relational value example.

3.2 Relational Value WebApp Marketplace

We have finished implementing the first version of our relation value system as a Web application marketplace [14] that has been demonstrated to the surveyed real estate agencies. It is programmed in ASP and hosted on the Amazon cloud. Users can only create an account after registering their email address, or connecting their Facebook account to the application with the minimal following permissions: email for communication, public profile information, and Facebook friends access, knowing that only friends who have also connected their account can be seen.

Care has been taken to comply with privacy laws such as the GDPR [15], for example, users can easily delete all their personal data after clicking on a "Delete account" button on the Web user interface. Several companies have already accepted to list their products on the marketplace, including one architect, a kitchen factory, and an association of local farmers. Once a company has joined, a list of its products is added to the marketplace, and at least

one of its certified employees is given the role of validator. Any user is able to click a button labeled "Request to be a Contributor" under a product as depicted in Figure 2 and submit a text description of her/his contribution to the product. In contrast to LinkedIn where users can display being an employee of any company listed on LinkedIn without validation, it was important that our application increases trust in the displayed information, which is also used to compute the relational value. In the future the certification of the companies validators will be as strong as Know Your Customer (KYC) check in banks, checking that they are really an employee of a company based on official paper-based checks through certified automated KYC software also known as Know Your Busine (KYB).
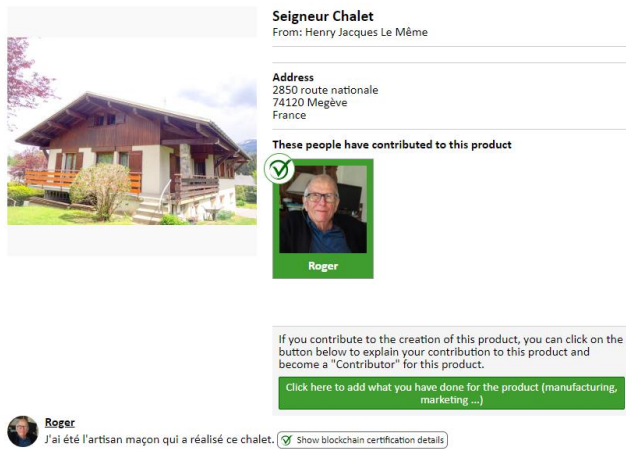

Figure 2: WebApp marketplace user interface.

However, before the contribution is accepted and displayed in the list of contributions to the product, the contribution must be approved by one of the designated company validators as depicted in Figure 3.

Figure 3: WebApp marketplace admin interface.

Figure 3 clearly shows that company validators can decide who is accepted as a contributor and cannot add contributors themselves to products. We have chosen a decentralized approach where contributors have to themselves confirm in what way they contribute to products in order to forbid companies to add fake contributions in the hope of artificially increasing their product relational value.

To further avoid cheating, we are tracking product contributions on a public blockchain (in our case NEO "Chinese Ethereum" [16]) as shown on Figure 4, and, in the future, we will even allow the users to sign their contributions from their own local crypto wallet with their local private keys rather than having to pass by our centralized Amazon-hosted marketplace with private keys that we control. In doing so, we cannot even cheat as an intermediary because the system is decentralized, and certified information is public, immutable, and auditable.

The Reputaction certifier smart contract is provided as open-source on Github [17]. It provides methods to certify that some information has been disclosed by the owner of a public key by adding permanently a signed record of the information on the NEO blockchain. It is deployed on the NEO 2.0 public MainNet blockchain with smart contract ScriptHash:

$$d82dd7188dc6dafb03d3df51783fde82a8f37359$$

Knowing the information, it is possible to compute the SHA256 hash of that information to retrieve who recorded it and when. For example, when a user of the Reputaction relational value marketplace adds her/his contribution to a product, it is also recorded via this smart contract.

On one hand, the smart contract doesn't implement any information delete method in order to avoid the deletion of cheating information and to achieve the highest level of transparency. Anybody can double-check which information has been disclosed and when.

On the other hand, one must be careful not to record personal information to comply with privacy rights and laws such as GDPR. For this reason, the Reputaction relational value marketplace records a URL that contains information about the contributor, but this information will be deleted if the user requests her/his right to be forgotten. If the users themselves record their information directly via their own crypto wallets and key pair, they are reminded that they shouldn't add personal information because they won't be able to delete it on the blockchain afterward. Reputaction patent pending hardened crypto-wallet will even allow the contributors to transact offline, which is also useful to confidentially transact tokenized shares of properties, i.e, without trace of change of property ownership on the blockchain but still with blockchain security and no risk of double-spending of property ownership [18].

This Reputaction certifier smart contract also provides helpers methods to disclose that someone controls a public key, when it was set alive, as well as link two pseudonyms and pass KYC / Anti-Money Laundering (AML) checks on partner KYC/AML providers

such as KYCBench [19]. A list of trustworthy partners as official recorders is also maintained in addition to Reputaction because it will help to compute the trust in the recorded information [20]–[22]. Letting the users sign their product contributions directly from their crypto wallet and allowing other recorders than Reputaction will create a fully decentralized relational value marketplace.

In the future, relational value data will also be served and managed by Reputaction through an Application Programming Interface (API). That API may require Reputaction utility tokens to be able to call costly tasks in order to reward better the product contributors beyond the price premium and higher visibility that the displayed relational value information intrinsically enables, as discussed in the next section.
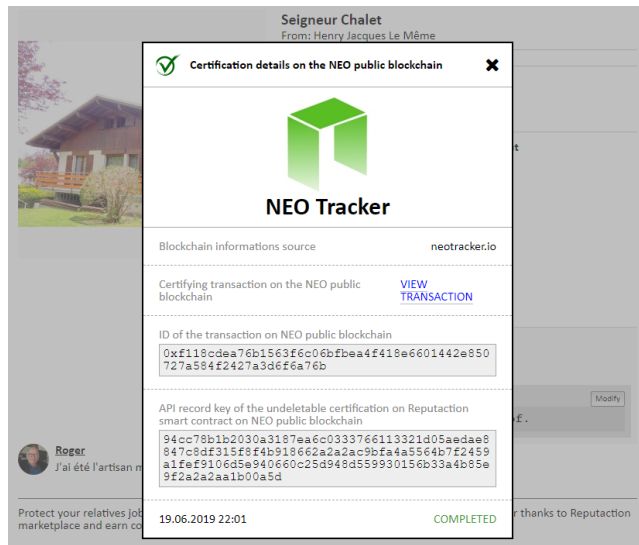

Figure 4: Contribution certified on NEO public blockchain.

4   SURVEY RESULTS

We have first carried out an online Google Surveys to understand better the price premium that people are willing to pay depending on different types of relationships the consumer may have with those who have contributed to the product. Then we present the results of a survey on real estate relational value that we have asked to real estate agencies.

4.1 Generic Relational Value Google Survey

We have paid an online survey to Google Surveys targeting the whole population of the USA older than 18 years old. Google Survey presented the four following questions related to the price premium impact of the types of relations that have contributed to a product. Each question had around 300 respondents.

For all of these questions, there is less than 95% confidence in the winning answer. More responses would be needed for a winner to be determined with statistical significance. However, it already gives an overall idea of the distribution of the answers. The results

shown in the following figures are weighted to represent the USA target population better. While surveys are running, Google Surveys dynamically targets respondents to match the demographics of the Internet population using their inferred demographics (age, gender, and geography). Google Surveys use estimates for the national Internet population from the U.S. Census Bureau's Current Population Survey (CPS) Computer and Internet Use Supplement.

After the survey has gathered responses, weights are applied to each response to match the breakdowns of age, gender, and region to those demographic breakdowns in the Internet population. Google Surveys uses an iterative raking process to calculate weights for each demographic dimension. For each question, the answers were displayed in a randomly reversed order, "I don't understand the question" was shown in the last position to each respondent, and, below all the answers, there was an open text box for textual open answers.

The first question was "Given 2 similar products, how much more would you pay for the most expensive product if one of your family members works for that product?". Figure 5 shows the results of question 1. 43,5% were prepared to pay more if one of their family members works for the product and 10,7% were prepared to pay more than 20% extra. Two respondents underlined that their decision would depend on if the product price is expensive or not: "depends on how much the percentage is equal to if 10 means 2 or 3 dollars sure if it means 1000 or more than i would go with the cheaper product"; "it depends on how expensive the product is". Two other respondents asked for a discount instead: "should i not get a family discount why would i want to pay more"; "i would expect to get a discount".
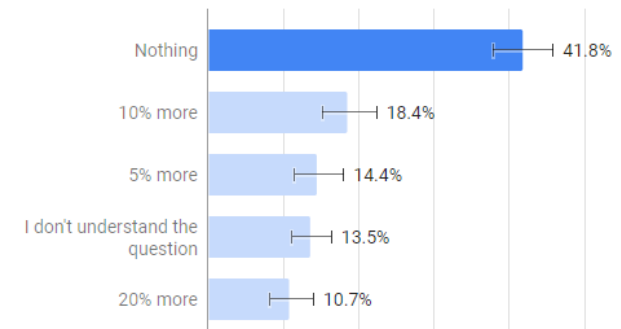

Figure 5: Question 1: "Given 2 similar products, how much more would you pay for the most expensive product if one of your family members works for that product?"

The second question was "Given 2 similar products, how much more would you pay for the most expensive product if one of your friends works for that product?". Figure 6 shows the results of question 2. 38,6% were prepared to pay more if one of their friends works for the product and 7,2% were prepared to pay 20% more.
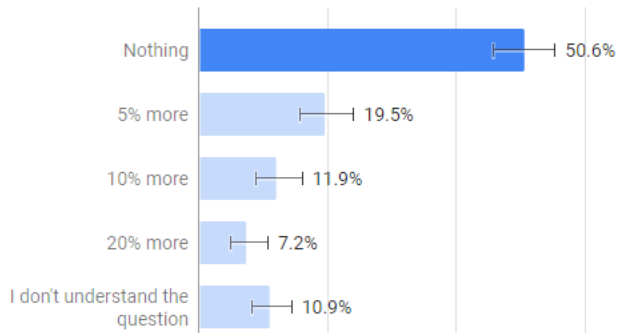
Figure 6: "Given 2 similar products, how much more would you pay for the most expensive product if one of your friends works for that product?"

The third question was "Given 2 similar products, how much more would you pay for the most expensive product if one of the friends of one of your friends works for that product?". Figure 7Figure shows the results of question 3. 22,9% were prepared to pay more if one of a friend of a friend works for the product and 2,9% were prepared to pay 20% more.
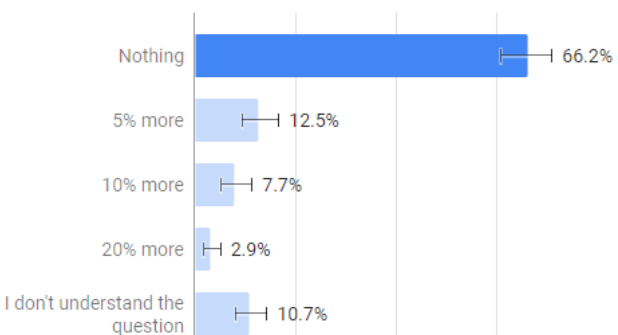

Figure 7: "Given 2 similar products, how much more would you pay for the most expensive product if one of the friends of one of your friends works for that product?"

The fourth question was "Given 2 similar products, how much more would you pay for the most expensive product if one of your family members works for that product and becomes jobless otherwise?". Figure 8 shows the results of question 4. 52,8% were prepared to pay more if one of their family members works for that product and would become jobless otherwise. 22,3% were prepared to pay an additional 20%. One of the text comments about this question was "is that a threat". Indeed, the potential buyers may feel forced to buy to preserve their relatives' jobs in that type of situation and information. The answers already show that it clearly increases the percentage of people willing to pay more and with a higher percentage. For this reason, malicious sellers may want to overuse such type of information. Our envisioned solution requires full transparency by the company, meaning that all revenues and expenses of the company should be made in crypto-currencies transactions captured in the blockchain public decentralized ledger in order to verify that it would still require to sell the product to be close to break-even.
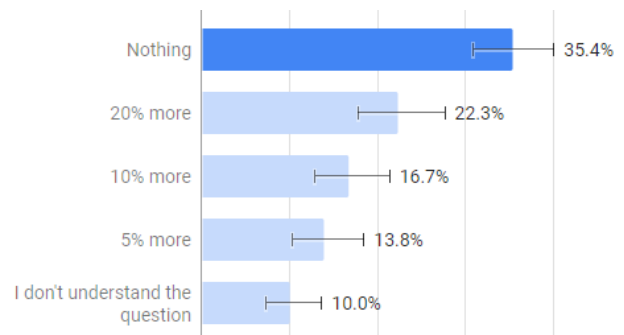

Figure 8: "Given 2 similar products, how much more would you pay for the most expensive product if one of your family members works for that product and becomes jobless otherwise?"

Therefore, the results not only confirm our hypothesis that the more a product is related to a person, the larger the price premium that could be imposed becomes, but it also provides an estimation of the said price premium. As summarized in Figure 9, the price premium is higher for family members than friends. Figure 9 also underlines that a price premium for friends of friends still exists even if it is lower than for family members and direct friends. Thus, having a service showing the photos of contributors labeled as friends of friends, such as the one that we have implemented, can still bring price premium.
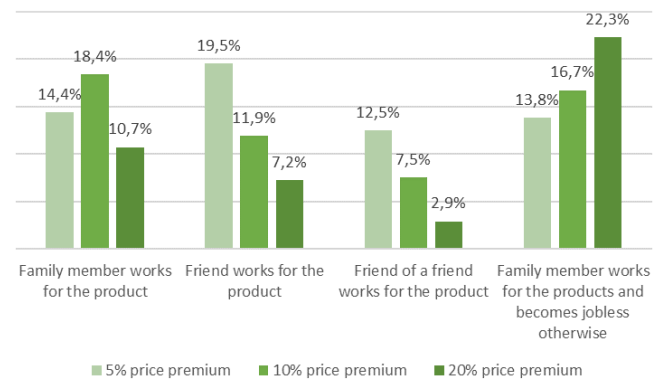

Figure 9: Relational value price premium results summary.

4.2 Real estate Relational Value Survey

As mentioned before, our WebApp has already a few partners in the real estate application domain. In July 2018, we have designed an online form to collect qualitative answers from the different types of stakeholders in the real estate application domain. We contacted by email and phone 40 real estate agencies, 30 architects, and 39 artisans in three main locations: Geneva and two upper-class Swiss ski resorts, Crans-Montana and Verbier. We chose to survey upper-class ski resorts in addition to an international city like Geneva because it is known that chalet houses in upper-class ski resorts may be built by under-paid foreigners and that local builders

(carpenters, plumbers…) lose some work and revenues for this reason. Although we carefully reminded the contacted real estate agencies, architects, and artisans, too few architects and artisans answered, maybe because of summer holidays and less time given to them to answer compared to real estate agencies that were contacted first. Therefore, in this paper, we only present the results given by the real estate agencies: overall 11 answered over 40 contacted (4 answered in Geneva over 20 contacted, 5 answered in Verbier over 10 contacted and 2 answered in Crans-Montana over 10 contacted). After accepting to answer our survey, they had to answer an online survey composed of 14 questions. The online survey started with 11 general questions about their market and customers, independently of our current WebApp, then they could watch a YouTube video presenting the concept of relational value applied to real estate and the main functionalities of our WebApp. After watching this video, they were asked three remaining questions specifically focused on our WebApp. The final question was an open question to collect their eventual text comment.

The first question that was asked concerned the level of competition in their market. All respondents in the three locations confirmed that their real estate market is competitive.

Then, we asked what were their main sources of customers. Online referencing of their Website was clearly their main source of customers followed by recommendations from friends and family members.

63,6% of them thought that their customers would have higher trust in their real estate products if they could know who has contributed to their construction and renovation. Figure 10 shows their number of customers out of 10 who ask about the quality of a real estate product, and the average was 7,27 out of 10.
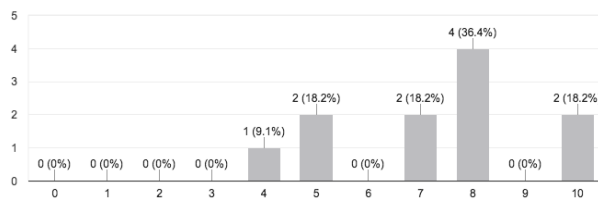

Figure 10: Number of customers asking about the quality of a real estate product out of 10.

Figure 11 presents the number of customers out of ten who ask to know if the artisans and companies who built the real estate products were Swiss, and the average was 2,73 out of 10.
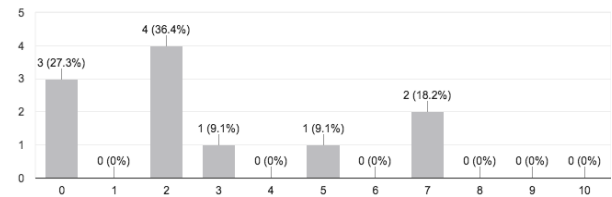

Figure 4: Number of customers asking to know the artisans and Swiss companies who have built a real estate product out of 10.

Figure 12 presents the number of customers out of ten who ask for more information regarding the materials used to build a real estate product, and the average was 6,09 out of 10.
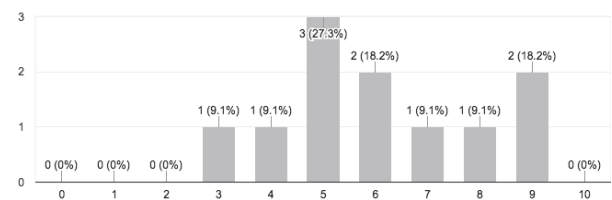

Figure 12: Number of customers asking about more information about the materials used to build a real estate product out of 10.

Although 6 out of the 11 real estate agencies said that 100% of the real estate products are made by Swiss artisans and companies, 2 of them thought it was more around 90% and 2 of them around 60%. Although we thought that real estate in the upper-class ski resorts would be more likely to be built by foreigners as it is the case in French upper-class ski resorts, only real estate agencies in Geneva mentioned less than 90%. One of them underlined that who was building is not important because there are often building according to well-known standards, and building insurances are valid for 10 years.

However, there is still risk after 10 years, and 10 years is not a very long time regarding the building lifecycle. All of them but two didn't believe that adding the photos and history of the artisans who had contributed to the real estate would increase its price. One underlined again that a real estate price depends more on the material quality, and, more importantly, its location than on the contributors quality. In contrast, one estimated that adding the photos and history of the artisans who had contributed to the real estate would increase its price by 15%. 36,4% of them thought that increased trust in the real estate product quality would decrease the buying decision time. 9,1% of them said that they would be interested in having such a service on their own. 36,4% were interested in having the additional feature also to collect the bills and materials used for real estate construction, maintenance, and renovation. They would be willing to pay around 37,5 CHF per month.

5 CONCLUSION

Based on our surveys, relational value increases when the product contributors are closer to the potential buyer. Family member contributors bring higher relational value than friends and friends bring higher relational value than friends of friends.

According to real estate agencies, although a good number of customers are looking to increase their trust and know the quality of real estate products, asking for information about the materials used is much more common than about the artisans and companies who have built them. It may be because, so far, it is still difficult to know who has contributed to a real estate product. Our WebApp also contributes to increasing visibility and online Web referencing of the artisans, architects, and real estate agencies, which are in a competitive market where online referencing is one of the main sources of visibility.

Our WebApp is in its first production phase with real customers and product companies starting to use it. As mentioned above, to further avoid cheating, we have connected it to a public blockchain and, in the future, we will even allow the users to sign their contributions from their cryptocurrencies wallet rather than to have to pass by our centralized Amazon-hosted marketplace. If all revenues and expenses would be transparently tracked thanks to cryptocurrencies on an open distributed ledger such as a public blockchain, we believe that our system could even honestly inform the potential buyer of the relational value of her/his buying decision: if the buying decision would bring the company closer to break-even, and thus avoid relations losing their jobs due to company financial unviability.

ACKNOWLEDGMENTS

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