CRYPTOGENES

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EVALUATING CRYPTOCURRENCY EXCHANGES

IN THE ABSENCE OF GOVERNMENTAL FRAMEWORKS

- A multiple criteria scoring model -

Dr. Patrick Schueffel, Adj. Professor

Institute of Finance
patrick.schueffel@hefr.ch

Nikolaj Groeneweg, MSc., M.A.

Cryptogenes.io

nikolaj.groeneweg@cryptogenes.io

HEG Fribourg

School of Management
Chemin du Musée 4
1700 Fribourg
Switzerland
Phone: +41 26 429 63 70
Fax: +41 26 429 63 75

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ABSTRACT

Since the introduction of Bitcoin in 2008, trading venues for cryptocurrencies, so called cryptocurrency exchanges, have undergone a fast development. Today cryptocurrencies totaling to more than USD 16bn are traded on more than 200 of such platforms, thereby surpassing the volume traded of numerous national stock exchanges. At the same time cryptocurrency exchanges are oftentimes not subject to a specific regulatory framework. Consumers who want to use these novel services are virtually left blindfolded when it comes to pivotal selection criteria. Yet, not even attempting to differentiate the quality levels provided by the various cryptocurrency exchanges would be tantamount to throwing out the baby with the bath water. In this work-in-progress paper, we develop an innovative scoring system to discriminate among cryptocurrency exchange offerings. In the absence of regulatory frameworks we identify 34 factors that may be considered by consumers when choosing the right cryptocurrency exchange offering. The advantages and disadvantages of such a scoring system are discussed and we provide suggestions for further development.

Keywords: Fintech; Innovation; Banking; Investment Decisions; Information Acquisition

INTRODUCTION

A cryptocurrency exchange is a platform that provides users with the possibility to trade cryptocurrencies for other cryptocurrencies or fiat money. Following the introduction of Bitcoin in 2008, the demand for the services of such platforms had been growing and the corresponding trading volume at such exchanges had steeply increased. During January 2018 the combined daily trading volumes of all cryptocurrency exchanges spiked to more than USD 70 billion per day. Whereas these volumes have retrenched since, we still observe daily trading volumes of more than USD 16 billion per day. (CoinCheckup, 2019; CoinMarketCap, 2019a). Such trading volumes which surpass those of some medium sized national stock exchanges, such as the ones of Italy (Borsa Italiana, 2019), France, The Netherlands, Belgium, Ireland, Portugal (Euronext, 2019) indicate that the cryptocurrency exchanges have left the infancy phase behind.

Oftentimes attracted by the upswing in trading volumes numerous players have entered the market. The total number of cryptocurrency exchanges has grown beyond 200 (CoinMarketCap, 2019b) whilst new platforms are entering the market (Bambrough, 2019; UTB, 2018) and additional ones have announced doing so in the near future (Cleveland, 2019).

In view of this upspring and further diversification of this new service a rather confusing situation emerges for consumers. Cryptocurrency exchange users may soon be at their wits' ends when tasked with choosing among the vast number of new service providers. What complicates matters further is that cryptocurrency exchanges not only

display a vast range of characteristics, but oftentimes conceal certain features from current and prospective users, rendering their services largely incomparable for the average cryptocurrency investor. Consequently, the consumer is largely left on his or her own devices when it comes to choosing the ideal service provider. Whilst there are some offerings on the Web, comparing cryptocurrency exchanges, the results are typically everything but transparent. At times the analysis is not more than a static list of exchanges providing a brief overview of the exchange (CaptainAltcoin, 2018; Kern, 2018) sometimes along with some pro and cons attributed to that exchange (Blockgeeks, 2018) or complemented with subjective user ratings (BestBitcoinExchange, 2019; CryptoCompare, 2019). The more dynamic offerings among these exchange comparison sites let the user select very specific characteristics expected to be displayed by the platform. Yet, these offerings are typically limited to very narrow set of features, such as funding channels for the investment account (Coinparator, 2019). Hence, none of these offerings provide the searching cryptocurrency investor with a comparison service that is at the same time truly comprehensive, transparent, dynamic and up-to-date.

In addition, the cryptocurrency investor is regularly entering unchartered waters when it comes to regulatory frameworks as far as Cryptocurrencies are concerned. Regulators such as the US Securities and Exchange Commission have therefore issued stern warnings against cryptocurrency exchanges (SEC, 2018). Unfortunately, also culprits strongly benefit from this unfettered environment: it is estimated that almost USD 1bn worth of Cryptocurrencies were stolen during the first three quarters of 2018 only (Chavez-Dreyfuss, 2018). This situation is all the more

troublesome as cryptocurrency exchanges play an important role as secondary markets for digital assets that have been issued via initial coin offerings (ICOs). An ICO can be defined as an unregulated capital-raising process used by firms in the cryptocurrency field as a substitute for the traditional funding methods (Schueffel, 2017). These ICOs have become an increasingly important source for funding of start-ups (Adhami, Giudici, & Martinazzi, 2018; Ahlstrom, Cumming, & Vismara, 2018; Block, Colombo, Cumming, & Vismara, 2018; Fisch, 2019). Therefore, having reliable secondary markets at disposal for such start-up financing vehicles would be of paramount interest to entrepreneurs, investors and policy makers alike.

Given that generally only incomplete information is supplied by cryptocurrency exchanges, the objective of this paper is to present potential cryptocurrency exchanges clients with a comprehensive set of decision criteria. Furthermore, we aim at developing a theoretically grounded yet innovative scoring model allowing customers to identify that one cryptocurrency exchange which is optimally suited to the client needs assumed the restricted available information. Moreover, due to the rise of cryptocurrency exchanges and their underlying complexity, a scoring model will enable researchers to study this phenomenon in more depth.

The remainder of this paper is structured as follows. First, we will give a brief theoretical background on the evaluation problems for services. Second, we will expound our strategy for building a suitability ranking for cryptocurrency exchanges. Third, we will briefly report on the results of a first empirical test. Finally, we discuss our model, theoretical and practical implications, limitations and future research avenues.

THEORETICAL BACKGROUND

Multiple criteria evaluation problems for services regularly consider a range of feasible alternatives and typically involve more than one single aspect to identify a suitability ranking for alternative solutions (Berry, Zeithaml, & Parasuraman, 1985; Johnston & Lyth, 1991; Sasser, Olsen, & Wyckoff, 1978). Nonetheless, scholars have not yet agreed on the number of determinants to be surveyed. Parasuraman, Zeithaml, and Berry (1985), for instance, suggest ten aspects of perceived service quality, whereas Johnston (1995) identified only four constructs to be significant in his study on service quality in the banking industry. On a more generic level, however, scholars indeed agree that an evaluation system should satisfy certain criteria to be considered sound. Keeney and Raiffa (1976), for example, proposed the following five characteristics when deriving the criteria for an evaluation system: (1) completeness, (2) operational, (3) decomposable, (4) non-redundancy, and (5) minimum size. Following these criteria as a basic precept the following strategy for building a suitability ranking was applied.

APPROACH FOR A CRYPTOCURRENCY EXCHANGE SUITABILITY RANKING

The here presented approach for modeling a suitability ranking for cryptocurrency exchanges follows a two-level approach. On a first level, we identified main themes relevant for deciding for or against a cryptocurrency exchange and on a second level, we identified the key items contributing to the first level themes.

The first level themes are mainly grounded in theory and have been identified as the following ones: *User Experience*, *Fees & Costs*, *Trustworthiness and Support*. They are described in more detail below and are depicted in the following figure:

Insert Fig. 1 about here

In its most basic form the suitability score is given by a mathematical function of the following kind:

$$SuitabilityScore = \sum UX,\ FC,\ TW,\ SU$$

User experience

Following the International Organization for Standardization (2010) User Experience can be defined as "[a] person's perceptions and responses that result from the use or anticipated use of a product, system or service". The concept of user experience has been widely spread and promptly acknowledged, both in the academic world, as well as in practice (Law, Roto, Hassenzahl, Vermeeren, & Kort, 2009).

After surveying multiple cryptocurrency exchange offerings we identified the following distinguishable factors as fundamental to the UX of cryptocurrency exchange offerings: *Ease of Registration*, i.e. how simple and fast the onboarding process is, including verification requirements and online identification etc., *Demo Account*, i.e. whether trial or demo accounts functionalities are offered, *Funding*, i.e. which funding methods exists and how efficient cash transfers can be initiated, *Withdrawals*, the lot of

funds that can be withdrawn per day, *Minimum Order Amount*, i.e. whether a minimum threshold exists for placing orders, *Geographic Scope*, i.e. which countries are supported, *Languages*, i.e. which natural languages are supported, *Corporates*, i.e. whether corporate clients are also onboarded, *Product Universe*, i.e. how many tokens can be traded and how many trading pairs are offered, *Trading Functionality*, i.e. which order types are being accepted, whether margin trading and OTC trading is offered, *Additional products*, whether derivatives on cryptocurrencies can be traded, such as derivatives or futures, *Initial Exchange Offerings*, whether the exchange offers support services for ICOs, *Technology*, i.e. which platforms are being served, whether dedicated apps exist, *Multichain*, i.e. whether the exchange supports trades across different distributed ledger technologies.

Insert Fig. 2 about here

On the second level, too, the individual items are summed up to individual scores. For *User Experience* (*UX*) the following summation is derived:

$$UX = \sum_{n=1}^{14} UX_n$$

Fees and Costs

Compared to product industries only relatively little scholarly knowledge exists on price perception and price satisfaction in the services industries (Voss, Parasuraman, & Grewal, 1998) and even less so in banking (Varki & Colgate, 2001).

Yet, the trading costs associated with a particular strategy represent the second most important determinant of investment performance after the strategy itself (Keim & Madhavan, 1997). "Trading costs can substantially reduce the notional, or 'paper,' return to an investment strategy" (Keim & Madhavan, 1997, p. p. 265). Consequently, it is not surprising that empirical data from the funds industry has shown that expense levels are negatively correlated with net returns (Carhart, 1997). Prior research has furthermore shown that pricing is also closely related to trading volume and thus liquidity. An empirical study by (Malinova & Park, 2015), for instance, has revealed that lower fees led to a significant increase in liquidity which manifested in a decrease in in bid-ask spreads, an surge in depth, and an growth in trading volume.

Moreover and based on empirical data polled from the banking clients, Colgate and Hedge (2001) concluded that pricing problems - and here more specifically unfair charges – were the biggest single factor causing complaints and causing switches to other banks. As cryptocurrency exchanges oftentimes target banking clients so that they can easily transfer fiat funds to the exchange, it can be assumed that pricing matters also strongly influence clients' decisions which cryptocurrency exchange to do business with. Costs are denoted as *FC* it this context. It is important to note, however, that costs find entry in our model in a reverse scale.

We propose to include the following items in a measure for Fees and Costs: Actual *Trading Volume* – as a proxy for the spread – and *Fees*.

Insert Fig. 3 about here

The second level theme *Fees and Costs* (*FC*) can be expressed with the following function:

$$FC = \sum_{o=1}^{2} FC_o$$

Trustworthiness

Drawing on the findings of Sako (1991), Ring and Van de Ven (1992), Barney and Hansen (1994) and Zaheer, McEvily, and Perrone (1998), Dyer and Chu (2003, p.58) define trust as “one party's confidence that the other party in the exchange relationship will not exploit its vulnerabilities”. Citing Mayer, Davis, and Schoorman (1995), Dyer and Chu (2003, p.58) argue that a "trustworthy" party in relationship is one that “(1) is known to reliably make good-faith efforts to behave in accordance with prior commitments, (2) makes adjustments (e.g., as market conditions change) in ways perceived as ‘fair’ by the exchange partner, and (3) does not take excessive advantage of an exchange partner even when the opportunity is available”. Consequently, it was suggested by Barney and Hansen (1994) that trustworthiness significantly reduces transaction costs in exchange relationships.

IT security is fundamental to an IT environment that is supposed to safeguard confidentiality, integrity, and availability of data (Cavusoglu, Mishra, & Raghunathan, 2004). Moreover, the stability of a provider of financial services largely determines a client’s trust in the firm (Knell & Stix, 2009) and thus the extent to which the customer

wants to do business with this counterparty. Consequently, IT security is also integrated in the broader topic of trustworthiness.

Since trust can be based on contractual as well as non-contractual mechanisms. (Williamson, 1991) we attempt to use capture both sides using a series of attributes. At times, these attributes serve as proxies which can indicate how trustworthy other users deem a cryptocurrency exchange.

Under the *Trustworthiness* umbrella we propose the following items: *Tenure*, i.e. the time the cryptocurrency exchange is already existing, *Legal Jurisdiction*, i.e. the legal framework it has to comply with as a having the registered legal entity in that jurisdiction, *Operative Jurisdiction*, i.e. the jurisdiction the cryptocurrency exchange is running crucial functions from, such as IT and operations, *Number of Users*, i.e. the number of registered users, *Overstated Volume*, i.e. how accurate the cryptocurrency reports trading volumes, resp. to which degree this figure is overstated, *Insurance*, i.e. whether the exchange is insured against theft of client funds, *Registration Soundness*, i.e. which documentation the trading platform requires to sign up a new client, *Authentication*, i.e. which type of authentication and encryption method is being used, *Centralisation*, i.e. whether the exchange is a centralized or decentralized exchange, *Wallet Option*, i.e. whether the exchange demands holding funds with a proprietary wallet or with other hard and/or software wallets, Inconsistencies, i.e. whether noteworthy inconsistencies exist among publications of the identical exchange, e.g. content on the Web site contradicts itself, press releases contradict Web site content etc.

Insert Fig. 4 about here

The corresponding summation function is the following one:

$$TW = \sum_{p=1}^{11} TW_p$$

Support

Building on the works of Grönroos (1984), Storey and Easingwood (1998) highlight the importance of service augmentation, i.e. those parts of the offering that do not represent the very core service. They stress the significance of the client's interaction with the service provider and - as part of that - the service organization's accessibility. Following furthermore Storey and Easingwood's (1998, p.337) notion that "customer's interactions are with the firm's physical resources and service systems, with employees, and possibly with other customers" the following positions were included in the support category: *Interaction types*, i.e. whether predominantly a human interacts with the client, or a bot or both, *Channels*, i.e. which interaction channels are provided to the client, *Languages*, i.e. the languages supported by the support channel, *Reachability*, i.e. at which times the service provider can be reached and *Response time*, i.e. how swiftly client requests are being answered.

Insert Fig. 5 about here

The following formula expresses the score for the theme *Support*:

$$SU = \sum_{q=1}^{5} SU_q$$

Depicting the first level themes along with the second level items in one graph, the following figure emerges:

Insert Fig. 6 about here

Furthermore, after breaking down the first level themes and defining the second level items, the initial suitability function can be refined as follows:

$$SuitabilityScore = \sum \sum_{n=1}^{14} UX_n, \sum_{o=1}^{2} FC_o, \sum_{p=1}^{11} TW_p, \sum_{q=1}^{5} SU_q$$

Moreover, this scoring framework can be adjusted on both levels, the first and second one to make provisions for individual user preferences. Making these provisions on the first level, the scoring formula then takes the following shape:

$$SuitabilityScore = \sum \frac{1}{a} \sum_{n=1}^{14} UX_n, \frac{1}{b} \sum_{o=1}^{2} FC_0, \frac{1}{c} \sum_{p=1}^{11} TW_p, \frac{1}{d} \sum_{q=1}^{5} SU_q$$

where $\sum a,\ b,\ c, d \equiv 100$

EMPIRICAL TEST

A first empirical test was conducted using the formula derived above. The model parameters, the data set and the experimental results are described in the following paragraphs.

Setting model parameters

Defining the parameters for this model is somewhat arbitrary at this stage of our research undertaking. Nevertheless, the authors defined values for every single realization for every single one of the 34 defined items. For the sake of brevity, however, the specifications of items are not discussed in this paper.

Data set

Data was collected from four cryptocurrency exchanges registered in Singapore. The data collection process lasted from January 2019 to March 2019. It involved visiting the corresponding Web pages of the service vendors as well as reading pamphlets and directly contacting the service organizations, when necessary.

Experimental Results

Using a uniform distribution function of the above mention Suitability Score function, we calculated the following values for four Singaporean cryptocurrency exchanges which we labelled as Alpha, Beta and Gamma.

Insert Tab. 1 about here

We note that the overall Trustworthiness scores are unexpectedly low for the exchanges we have reviewed, all of which are critically acclaimed for their trustworthiness within the Singaporean crypto scene. None of the exchanges score more than half of the possible score, leaving sizeable margins for improvement (the highest Trustworthiness score being 54,55 our of 100). While some might argue that this implies our evaluation criteria are too strict, we would strongly disagree with such a view. Rather, we would argue that Factors such as Honesty, Registration Soundness and the lack of Inconsistencies, reflect minimal requirements for any evaluation of trustworthiness - raising the question of why other third-party evaluations appear in such disagreement with the results obtained by the method outlined here.

DISCUSSION

Scholarly works on Fintech in general and cryptocurrency exchanges in particular are still extremely scarce. The conceptual scoring model presented here has attempted to identify precursors of cryptocurrency exchange suitability to client needs. It does so by categorizing items into non-overlapping themes.

The inter-theme comparisons highlight the fact that clients – depending on user preferences – may come to entirely different conclusions on which cryptocurrency exchange they may prefer, depending on which attributes they set great by. For example, should a customer be extremely sensitive about Trustworthiness, he or she may not choose the overall best offering, but the one that scores best on these items.

Hence, such scoring model may yield great benefits to users as they can individually drill down on those attributes, they want to put a particular emphasis on. The need to provide users which such options appears all the more important to us as regulation is lacking in the cryptocurrency exchange business. What is more, none of the exchanges surveyed in our empirical test, conducted audits. Providing the investor with other proxies for reliability and compliance becomes therefore more important.

Implications for Theory

By suggesting a multiple criteria scoring model, we have endeavored to further deepen our understanding of the mode of action of cryptocurrency exchanges. In fact, the model highlights potential antecedents to client satisfaction that have not been touched upon in cryptocurrency literature thus far. Our research takes a step toward opening the black box of cryptocurrency exchanges by mapping and extending our understanding of the sources of perceived client suitability. One theoretical contribution of this paper is the presentation of themes and items that potentially serve as the antecedents of client satisfaction. With this research, we hope to contribute to laying the ground for research concerning cryptocurrency exchange services.

The findings of this paper furthermore contribute to the literature of computing systems literature as it partially also answers to the call for developing UX scoring systems (Hassenzahl & Sandweg, 2004).

Implications for Practice

One central objective of marketing is customer loyalty as it is tightly related to recommendations, cross-selling opportunities, decreased price sensitivities and larges shares of wallet (Anderson, Fornell, & Lehmann, 1994; Matzler, Hinterhuber, Daxer, & Huber, 2005; Reichheld & Sasser, 1990; Zeithaml, 2000). These findings are further highlighted by Hallowell (1996) who demonstrates in a banking setting that customer satisfaction is related to customer loyalty, which, in turn, is related to profitability. Hence, customer satisfaction management should be high on the agenda of any manager in the financial services industry. As this research is particularly tailored to cryptocurrency exchange, the findings should be of high interest to any manager at cryptocurrency exchanges. The scoring model provided can serve as a tangible list to audit the offering and initiate improvements where necessary.

Next to managers, our findings have first and foremost their merits for consumers. Prospect cryptocurrency exchange clients are regularly left in the dark as far as regulatory frameworks are concerned. Our scoring model helps them to nevertheless identify the ideal service provider given a situation of incomplete information. It therefore may also contribute as means for consumer protection.

LIMITATIONS

Obviously, no research is without limitations and this paper is no exception. The scoring model presented here represents work in progress and therefore the parameter definitions for this model are somewhat subjective. While the themes and

items have been carefully derived from the extant body of literature, numerous additional themes or items may exist.

In addition, the score yielded by this model has not been normalized yet, i.e. it represents an open-ended scale. This may complicate comparisons of individual service providers.

Suggestions for Future Research

Being the first identifiable work of its kind in the field of cryptocurrency exchange, this scoring model requires further refinement based on empirical data. We therefore suggest testing the model with numerous test clients and to adjust themes, items and weights, if necessary.

In order to enhance the transparency of comparisons across cryptocurrency exchanges, it would be useful to normalize the scoring scale, e.g. on a scale between 0 and 100. This could be a further research avenue when enhancing this model.

CONCLUSION

Scoring models have been widely used in the Management Sciences for decades (Moore & Baker, 1969). In Finance they predominantly find their applications in credit scoring (Mester, 1997). Yet, as we have shown in this paper scoring models can also be a valuable technique to be applied to new service offerings such as cryptocurrency exchanges. The statistical evaluation model performs favourably only when the

essential information is available. The data necessary to perform such a task is typically either available on the Web or disclosed by the service provider. This paper provides 34 alternative criteria to evaluate a cryptocurrency exchange's offering in the absence of regulatory frameworks. It can therefore be seen as a remedy to the current state of insufficient transparency in the field of cryptocurrency exchanges which is expected to further worsen over the years to come as many more offerings will be brought to the market.

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FIGURES

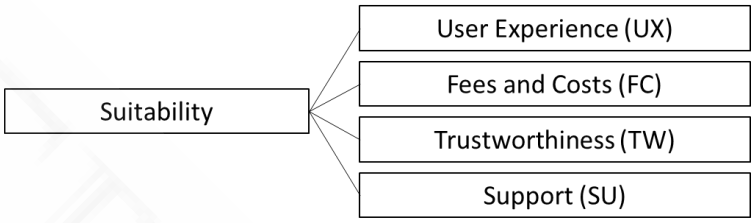

Fig. 1. Suitability score, first level

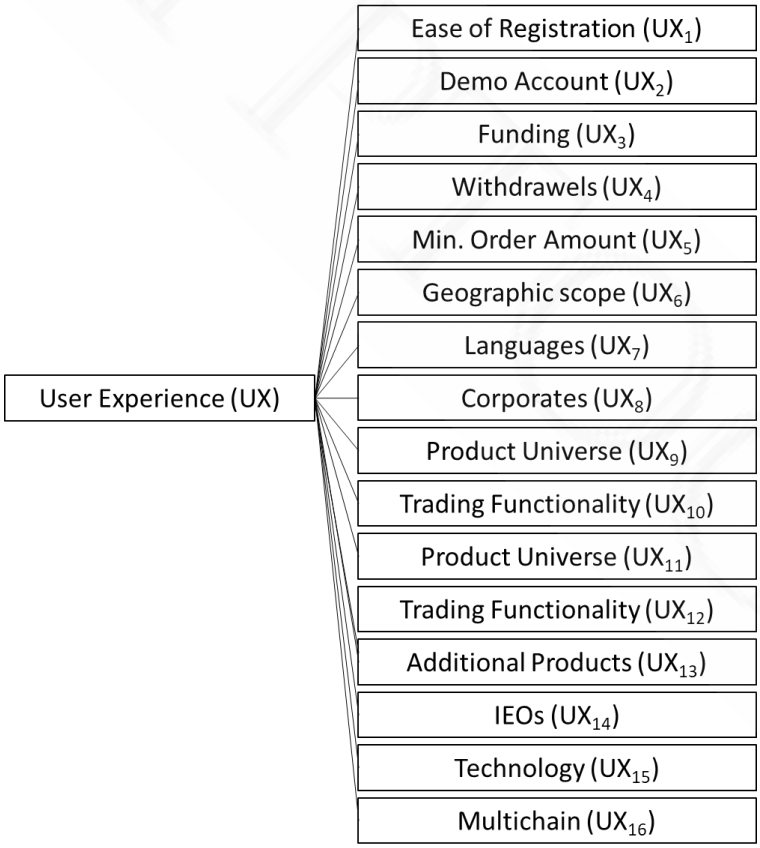

Fig. 2. Suitability score, second level, user experience

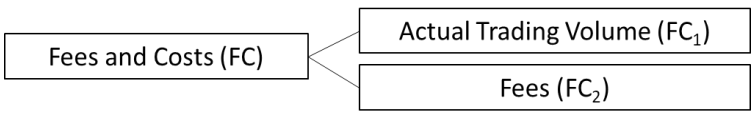

Fig. 3. Suitability score, second level, fees and costs

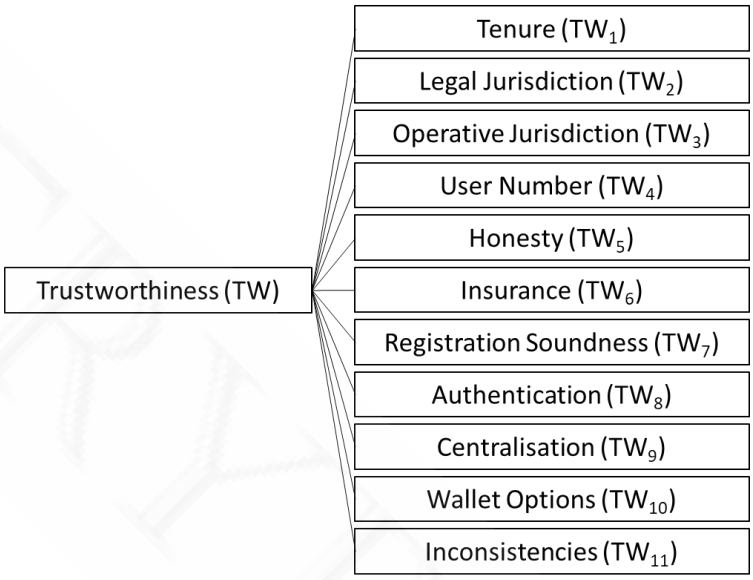

Fig. 4. Suitability score, second level, trustworthiness

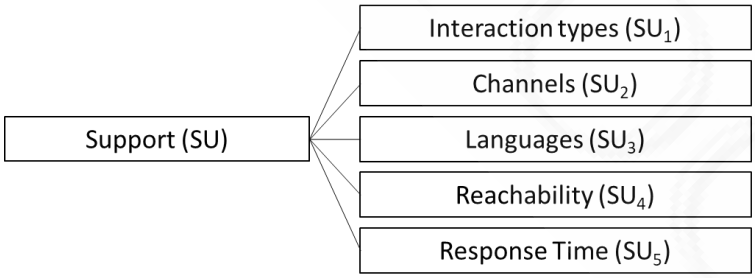

Fig. 5. Suitability score, second level, support

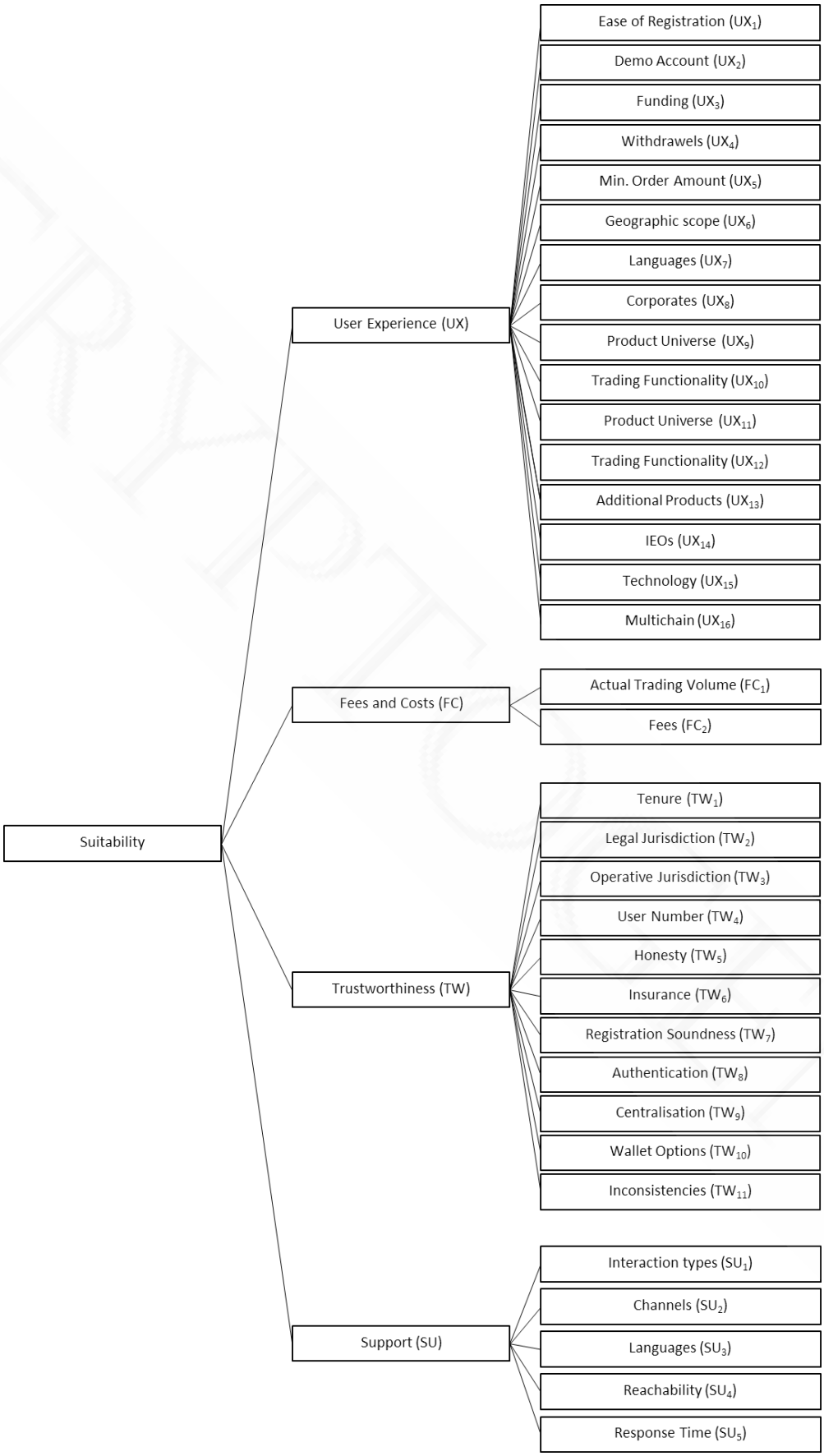

Fig. 6. Suitability score, first and second level

TABLES

		Alpha	Beta	Gamma	Delta
User Experience		**35,35**	**36,48**	**52 3/7**	**60,56**
	Ease of Registration	71 2/3	80	63 1/3	66 2/3
	Demo Account	0	0	0	0
	Funding	33 1/3	33 1/3	33 1/3	50
	Withdrawels	40	20	60	20
	Minimum Order Amount	0	100	100	100
	Geographic scope	100	100	100	100
	Languages	66 2/3	33 1/3	66 2/3	100
	Corporates	66 2/3	33 1/3	66 2/3	100
	Product universe	50	33,00	33	100
	Trading Functionality	11	11	44 1/3	11 1/9
	Additional Products	0	0	0	0
	IEOs	0	0	100	100
	Technology	55 5/9	66 2/3	66 2/3	66 2/3
	Multichain	0	0	0	100
Fees & Costs		**60.50**	**8 1/3**	**22 1/2**	**47.50**
	Act. Trading Volume	91	0	10	55
	Fees	30	16 2/3	10	40
Trustworthiness		**42,73**	**48,78**	**50,00**	**54.55**
	Tenure	50	100	0	50
	Legal Jurisdiction	20	20	20	20
	Operative Jurisdiction	100	20	100	100
	User Number	100	50	30	30
	Honesty	0	0	100	100
	Insurance	0	0	0	0
	Registration Soundness	100	100	100	100
	Authentication	100	66 2/3	100	100
	Centralisation	0	0	0	0
	Wallet options	0	0	0	0
	Inconsistencies	0	100	100	100

Support		**44 8/15**	**64 8/15**	**49 4/15**	**54.53**
	Interaction types	66	66	33	66
	Channels	16 2/3	16 2/3	33 1/3	66 2/3
	Languages	50	100	0	0
	Reachability	40	40	80	40
	Response Time	50	100	100	100
TOTAL		**45,78**	**40,13**	**42,30**	**54.28**

Tab. 1. Score results empirical test