PARETO.

Technical White Paper

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"For many events, roughly 80% of the effects come from 20% of the causes"

— **Vilfredo Pareto**

INTRODUCTION.

The Pareto Network is a service for incentivizing the generation and sharing of information about tradable opportunities in cryptocurrencies and related assets. It is designed to elevate information about market inefficiencies and promote more accurate price discovery. What that means is that it should steer the markets toward the correct pricing of assets.

It replaces the research desks at investment banks with a flow of privileged information that anyone can access, and aligns economic incentives to promote that reality.
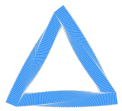
△ BACKGROUND.

The current state of investment research for blockchain businesses and cryptocurrencies is cumbersome and leaves a lot to be desired.

Cryptocurrencies differ measurably from conventional equities or forex as a subject of investment analysis. An assessment of the viability of a new currency or token typically requires an evaluation of an open source software project, a proposed model of a decentralized market, a design for new forms of economic incentives and behavior, and other considerations such as the long term viability of the blockchain or protocol stack within which the token resides. In combination, these differences create an investment challenge that defies the simple application of existing investment information tools, which are centered on the analysis of balance sheets, P&L statements, and commercial transactions under GAAP accounting as well as projections of factors such as market share, sales and profitability into the future. Moreover, the investors in crypto markets are more global in distribution and more diverse in background than investors in conventional markets. As such they are less likely to have access to conventional sources of equity or forex research. [12]

Confounding these challenges is the rapid pace of new token and cryptocurrency offerings. As of July 2017 over 800 cryptocurrencies are available to investors and it is likely that as many as 1,000 new

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[1] Conventional research performed by investment banks and buy side analysts has undergone a dramatic decline since the financial crisis of 2009, dropping nearly 50%. This appears to be related to the reduction in advisory fees and more recently, regulation in the European Union requires the separation of customer charges for research expense from brokerage service fees. *Banks Forced to Shake Up Analyst Research Business,* Wall Street Journal, Feb. 2015.
https://www.wsj.com/articles/new-rules-poised-to-reshape-analyst-research-sector-1423514292
[2]Robin Wigglesworth, *Final Call for the Research Analyst?,* Financial Times, February 7, 2017. https://www.ft.com/content/85ee225a-ec4e-11e6-930f-061b01e23655

token/currency offerings will occur over the next year alone. This will doubtless include tremendous opportunities for investors. But the large number of choices presents a bewildering landscape. Investors will be challenged to differentiate between these opportunities and seek tools to help devise and implement an investment and allocation strategy.

Today, finding information on investment in the cryptocurrency space is often a fairly random process. The major sources include:

- YouTube channels, some affiliated with specific currency. Most of these channels have between 5,000 and 25,000 subscribers. The quality of the production and the advice offered varies widely.

- Industry news sites such as CoinDesk, The Merkle, Bitcoinist, CoinTelegraph, and numerous others provide news stories on the overall market direction, notable transactions and events, press releases, individual currencies, and other developments.

- Research reports on new tokens such as Smith & Crown. Some of the reports are more extensive than others and many tokens have no objective reviewers. Much of the information in these reports at this point in time appears to come from the issuer's white paper and other material provided by the token creators themselves.

- Bloggers, including personal blogs (often on Medium) and blogs on the sites of Foundations, venture investors, and thought leaders. While some of these writers offer valuable insights these blogs are not centralized or organized in a way that makes it practical to effectively consume such insights.[3]

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[3]An example is the writing on blockchain protocol economics of Joel Monegro at Union Square Ventures. https://www.usv.com/thread/blockstack

- Exchanges and market data sites: Price and volume, bid and ask data from exchanges including historical charts. Coinmarketcap.com, Poloniex, Bittrex, and others. Some provide data via APIs (such as coincap.io).

- Blockchain explorers, such as Blockchain.info and Etherscan.io, which contain information on the concentration of holdings and the volume and pace of transactions.

- Forum Posts. One of most potentially valuble sources of actionable insights is the forums focused on individual currencies. These include the Slack Channels of the Currency's developer or foundation themselves as well as discussion areas focused on crypto within various open forums such as Reddit and StackExchange.

- Steemit provide a useful source of advice and forecasts and may include a compensation-feedback mechanism. However, their broad focus on social sharing of information about "almost anything" leads to a more diffuse stream of information. Pareto adds a more focused financial information platform and provides substantial economic incentives (orders of magnitude greater) for a knowledgeable contributor to invest their effort in producing a valuable, well researched, and well-reasoned piece of information.

PHILOSOPHY.

The Pareto Network is designed to promote utility and scarcity in the Pareto token (PXT) while promoting the existence of a liquid secondary market for PXT.

The Pareto platform and ecosystem aims to create value through increasing the overall efficiency of cryptocurrency markets. This has several aspects to detail. By means of its voting/reputation-driven rewards mechanism, Pareto encourages the production of actionable market information and helps token users filter noise from meaningful information. More subtly, through its taxonomies and organization of information feeds, Pareto will play a role in structuring the types of information produced and advancing the level of understanding of cryptocurrency investment analysis.

The infrastructure and network was designed after researching the ideals, shortcomings and advantages of other blockchain token offerings over the last half a decade. Failing to address or align the economic incentives of the target market participants hampered the execution of many projects.

The Pareto philosophy can be extended to existing and future cryptoasset offerings to attract capital to this space and realize the shared ideals of evolving the finance sector and the world around it by proxy.
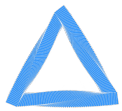
The Pareto Network will facilitate the growth of an ecosystem for the creation and distribution of content related to investment in crypto assets.
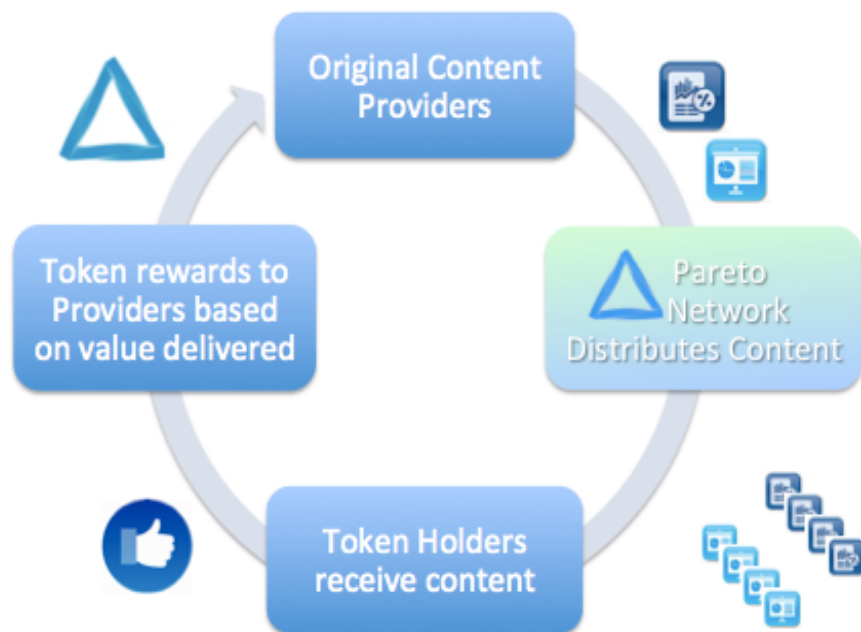
Original Information Content

The Network will ingest and distribute a broad range of information that may be of value to investors. Such information will include (but is not limited to) the following:

- Analyst reports – coverage of new & existing tradable tokens or investments
- Sector reports (e.g. storage, prediction, computing)
- Analyst reports on return on staking/mining
- Technical trading alerts and reports

- Codebase reviews
- Code vulnerability and security assessments
- Evaluation of investor tools
- Evaluation and discussion of fund management tools
- Crypto investment manager surveys

Content Contributors

Content contributors (Content Providers) may be individuals, groups or organizations. They may generate single items of information or multiple items produced over time. They may generate ongoing streams of information.

Submissions of content to the Pareto Network are open to anyone although the Network will exercise discretion to prevent content that is not related to investment or is inappropriate. During the initial operation and for some period the Pareto organization will curate content to ensure a level of quality and relevance that delivers value to Token Holders.

Content Provider Rewards Cycle & Information Waterfall
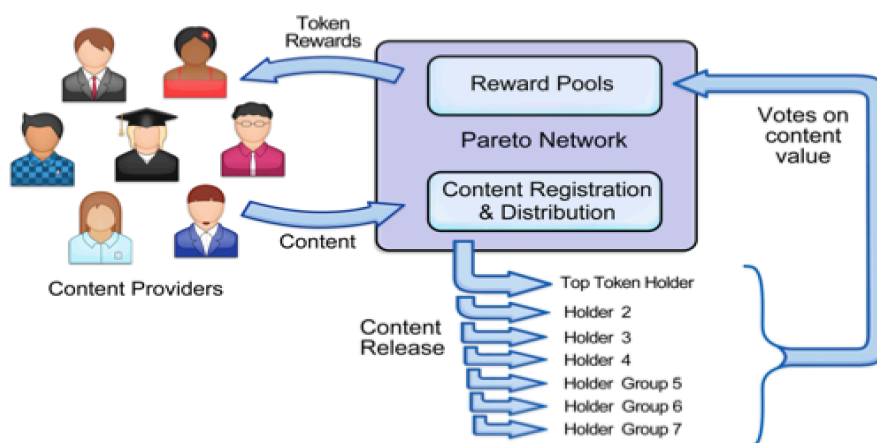
1. Token Holders spend tokens to increase their ranking in the ladder and these tokens go into the Content Reward Pool
2. Original Content Providers contribute content to Pareto Network
3. Pareto Network distributes content Data Item releases to Token Holders in prioritized sequence
4. Token Holders "vote" on the value of Content Data Item Releases
5. Tokens are rewarded to Content Providers with reward amount partially based on token holder voting

The Pareto Network uses a ranking algorithm to determine the order in which holders are provided with the information created by the content providers. The outcome of the ranking algorithm is called the waterfall, and it is akin to a leaderboard.

There are a variety of criteria which have an influence on a holder's position within the waterfall and these can be used strategically to obtain information sooner than other holders.

Content providers are likewise incentivized to create content which can be actionable amongst the holders as well as compete for the optimal kind and price of information for the Pareto Network.

The generalized formula for a holder's ranking is as follows:

$$\left(\sum_{P=0}^{B_{n-c}} \text{Address}\,(P) \right) \times \left(B_{n-c} - (1/n \sum_{i=1}^{n} \alpha^i)_P \right)^V$$

where

$$V = 1 + \left(\frac{x\,/\,M}{2} \right)$$

and

$$x \geq 0,\, x = \sum_{v=0}^{B_y} v,\, x \leq 2$$

Definitions:

Address   The signed address containing Pareto tokens

P   A quantity of Pareto tokens

B   Block height. The total number of blocks till the top of the blockchain.

B_n is the current block height.

B_c is the confirmed block height. "c" can be set by the Pareto system based on the perceived confidence in consensus of the host blockchain.

B_y is the lowest block used by the Pareto system to determine how many votes a user has made. Votes eventually stop being counted for a holder's ranking.

M	The weighting of the total number of votes.
	For example, with a weighting of 50 and an eligible vote count of 1, the votes would be worth .02 in the system, allowing for 100 eligible votes to obtain the maximum exponential effect. Whereas a weighting of 100 would make votes worth .01 in the system, allowing for 200 eligible votes to obtain the maximum exponential effect.
V	This is a representation of the voting algorithm.
v	A vote.
x	Number of votes a Pareto holder has made since the lowest counted block.

Step by Step:

In its simplest form, the algorithm is simply counting how many Pareto tokens a holder owns, and weighing that against how long they've held those tokens.

$$\sum_{P=0}^{B_{n-c}} \text{Address}\,(P)$$

A summation representing a count of how many Pareto tokens are in an address.

The Pareto system uses a block explorer to check how many Pareto tokens an individual address has, starting from 0 tokens, until a system specified number of confirmations away from the greatest block height.

$$B_{n-c} - (1/n \sum_{i=1}^{n} \alpha^i)_P$$

The longer a holder keeps a stake in Pareto, the greater their ranking in the Pareto system becomes and

holders with a higher ranking receive information sooner than a holder with a lower ranking.

This is Pareto system block height minus the weighted average block height that an address holds Pareto. It is a weighted average of amount of Pareto per block.

$$V = 1 + \left(\frac{x \,/\, M}{2}\right)$$

and

$$x \geq 0, x = \sum_{v=0}^{B_y} v, x \leq 2$$

V is an exponent, which is currently set to 1 for all holders. The voting mechanism is a way to both compensate providers and also boost a holder's ranking, exponentially.

V can be as low as 1, and can be as high as 2. With enough votes (little v) a holder can exponentially double their ranking for a temporary time period, giving them enhanced access to more information sooner. This provides an incentive for holders to vote for a content provider after receiving profitable information.

Votes have a cost, set by content providers, and this cost is paid directly to the content provider. Votes stop being counted for this exponent after a certain number of blocks, readjusting the ranking of holders and incentivizing them to continue acting on profitable information, and having a desire to get this profitable information sooner.

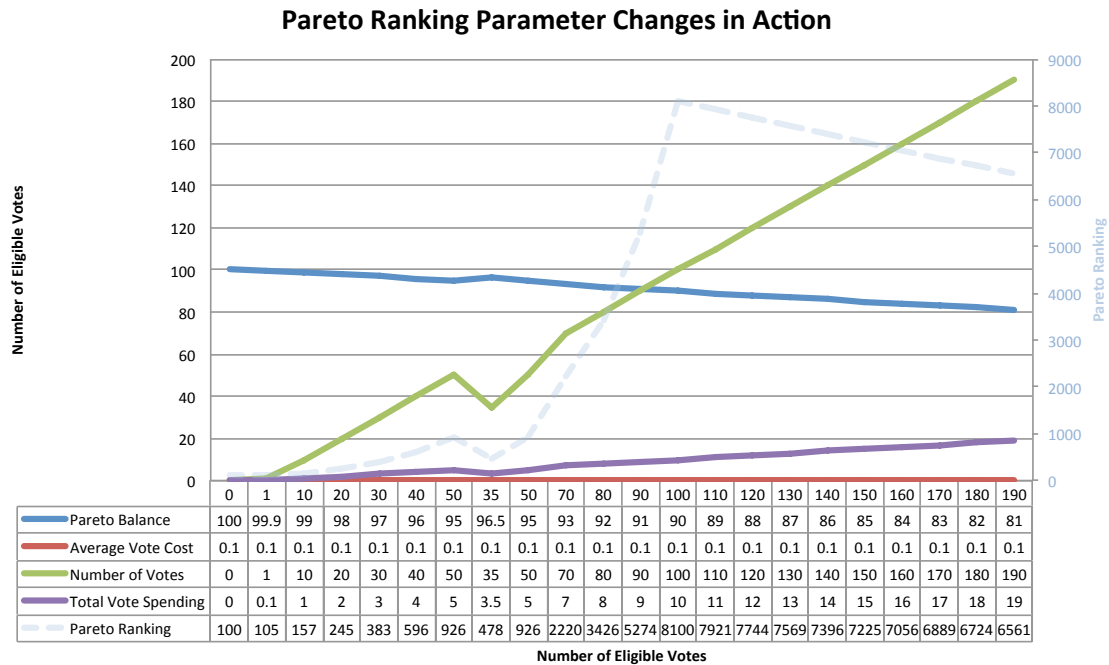As votes modify an exponent on a holder's ranking formula, it should become clear that votes are the best way to increase a holder's ranking in the Pareto system. The following visualization is meant to illustrate the dramatic possibilities and upper bound limitations of voting in the ranking algorithm.

Pareto Ranking Changes After Voting

Number of Eligible Votes	0	1	10	20	30	40	50	35	50	70	80	90	100	110	120	130	140	150	160	170	180	190
Pareto Ranking	100	105	157	245	383	596	926	478	926	2220	3426	5274	8100	7921	7744	7569	7396	7225	7056	6889	6724	6561
Exponent	1	1.01	1.1	1.2	1.3	1.4	1.5	1.35	1.5	1.7	1.8	1.9	2	2	2	2	2	2	2	2	2	2
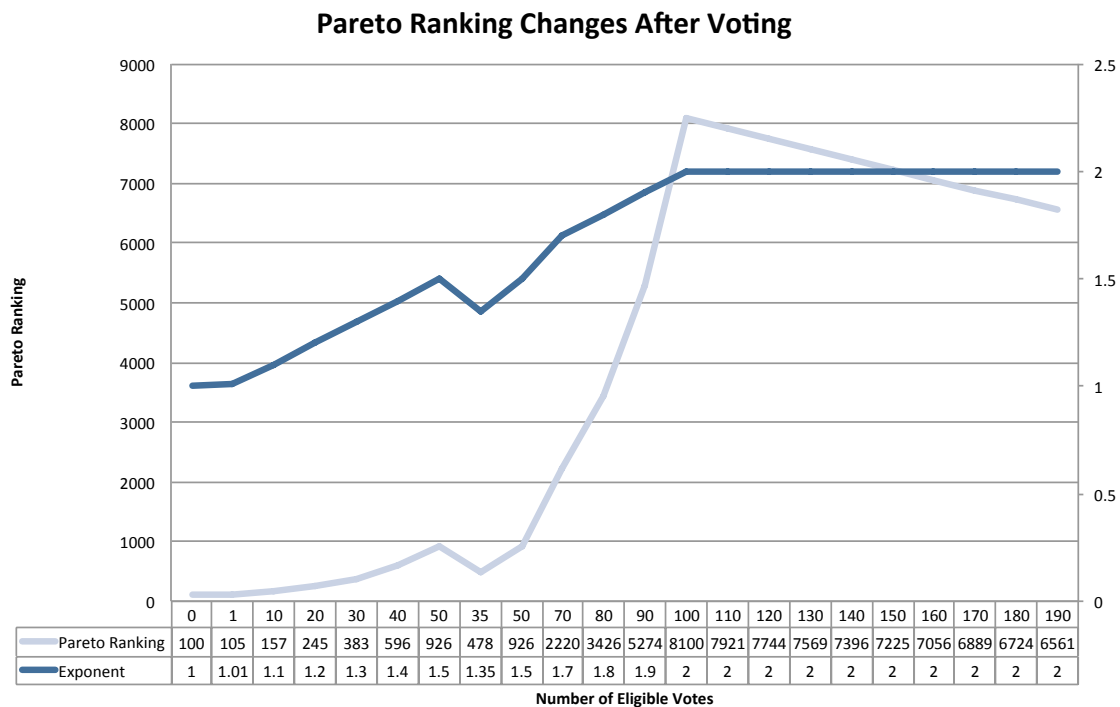
In this example, the holder started with a balance of 100 Pareto, the holder never acquired additional Pareto but is spending their Pareto balance on votes with an average cost of .1 Pareto each. Vote cost can be set by the content providers and they will find an equilibrium of what a practical amount is.

This example assumes all of their Pareto was acquired at the same time, and doesn't factor in the length of their holding period. As such, this example exists in a vacuum and neglects other holder's ranking against this holder's, as well as their buying patterns to improve their ranking.
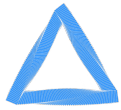
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The interplay for the individual holder is further illustrated in an accompanying graph revealing the data used in the ranking algorithm.

Pareto Ranking Parameter Changes in Action

	0	1	10	20	30	40	50	35	50	70	80	90	100	110	120	130	140	150	160	170	180	190
Pareto Balance	100	99.9	99	98	97	96	95	96.5	95	93	92	91	90	89	88	87	86	85	84	83	82	81
Average Vote Cost	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Number of Votes	0	1	10	20	30	40	50	35	50	70	80	90	100	110	120	130	140	150	160	170	180	190
Total Vote Spending	0	0.1	1	2	3	4	5	3.5	5	7	8	9	10	11	12	13	14	15	16	17	18	19
Pareto Ranking	100	105	157	245	383	596	926	478	926	2220	3426	5274	8100	7921	7744	7569	7396	7225	7056	6889	6724	6561

Number of Eligible Votes

The holder's Pareto balance dropped from 100 to 80 but their ranking actually increased due to the voting pattern.

The system is designed to promote payment to the content providers, motivated by upward movement in the ranking. Eventual inequality is expected and changes to the algorithm can be made to reduce inequality, to incentivize newcomers to participate in the Pareto system. This is a factor of the philosophy that the Pareto system is intended to promote. These changes will be made in a way that continues to promote the value of and confidence in Pareto tokens.

The summary of holder behavior is based on the holders receiving profitable information, paying the content provider for it in an action called voting, and moving up the ranking to receive profitable information sooner.

PARETO MARKET VALUE.

How much can Pareto tokens be worth?

Pareto tokens are as valuable as the information in the Pareto Network is, or as valuable as future information in the Network is perceived to be.

People are incentivized to put information into the Pareto Network because they can earn more from the information than acting on the information themselves. Analysts and engineers typically do not have the capital or infrastructure necessary to most effectively take advantage of nuanced information. Aside from finding the people with capital, negotiating the most favorable incentives is a minefield and the information's actionable time period is short lived. Finally, many forms of privileged information have increased liability if it is acted upon.
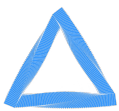
DIFFERENCE FROM PREDICTION MARKETS
(Augur, Gnosis, Wings, etc.)

Prediction markets rely on the wisdom of the crowd, promoting a binary side bet that something will or will not happen, or that opposites will happen. It is meant to aggregate all available information to determine what team will win, who will win an election, and other forms of binary events. The purpose is to create a limited incentive for people to put money behind a decision they believe in. The limitation comes from both the kinds of information

that can be applicable to a prediction market, and the information available to the crowd to begin with. Finally, markets may not form at all outside of the biggest events already in the collective conscious, exacerbating an already irreconcilable liquidity problem.

There are many circumstances to suggest that there is no wisdom of the crowd, such as in the options markets and in elections, yet prediction markets do not provide a liquid enough venue to make contrarian decisions. The liquidity concern is proportionate to the funds available to other betters, whereas information is the only form of liquidity in the Pareto system. The cryptocurrency financial markets are not transparent enough for the whole market to make rational decisions, and the market participants are not rational to begin with.

The market consistently discounts improbable situations, and this is reflected in prediction markets.

The Pareto Network provides an incentive to disclose the improbable. The compensation becomes a simple factor of enabling the most people to make a profit the soonest. Those people are in turn incentivized to compensate the content providers with Pareto tokens, as that action improves their ranking on the Pareto leaderboard and allows those people to get the next information disclosure sooner.

CASE STUDIES.

Details of a double spend vulnerability on a small cryptocurrency may be worth several million dollars. A double spend allows someone to inflate the supply of the cryptocurrency and create money out of nothing, with no consequence socially or legally. Confidence in cryptocurrencies comes from the ability to prevent that, and smaller cryptocurrencies are not as secure as bigger ones for

a variety of reasons. In April 2017, the Monero team discovered vulnerability in the underlying Cryptonote protocol which affected Monero, Boolberry, Bytecoin DigitalNote, AEON and a handful of other cryptocurrencies. The Monero team disclosed it to perhaps a dozen software engineers so that they could fix the vulnerability in private, before an inevitable scheduled public disclosure a month later. By the time of the public disclosures, it would be expected that the problem would have already been fixed. After the public disclosure it was shown that the exploit was executed on Bytecoin. Over $1.6 million worth of Bytecoin was created and sold during the time of the private disclosure. This required already owning a lot of Bytecoin (capital), understanding how to execute the vulnerability (deeply technical knowledge), and having the knowledge during a short time frame.

Having all three of those advantages is difficult and unlikely. The Pareto Network makes it easy to monetize this kind of information. The engineer would input the details into the Pareto Network and the most well positioned holders of Pareto would act on this information and tip the engineer for more disclosures. The action of tipping allows the Pareto holder to be privy to more information faster, as it improves their ranking in the Pareto leaderboard. Pareto holders who are higher in the leaderboard will receive information before people lower in the leaderboard.

Details of a central bank policy decision can be worth several billion dollars. George Soros is infamous for "breaking the Bank of England", as he predicted that the central bank artificially kept the exchange rate of pounds at a price that nobody was willing to pay. The British government only had £27 billion worth of property (metals, foreign currencies) that it could use to buy pounds on the open market in a massive bid to prop up the exchange rate. George Soros went short on the pound with $15 billion, and the rest of the market did too *as they caught on to what was going on.* That day, the British government tried to raise interest rates twice, hoping that rich foreigners seeking yield would also buy more pounds, since the

government only had £27 billion to buy with to support the price and the global market was selling much more into it. Unfortunately, this was during the middle of a recession, raising interest rates did not increase interest in the pound, and it was career suicide for politicians to raise interest rates in a struggling economy, so the government had to abandon its taxpayer funded bid as it was a horrible speculative trade of their own currency and mismanagement of the state trading fund (British Treasury). George Soros' fund made $7 billion in a highly leveraged trade, as the British Pound plummeted 25% over a few days. All British taxpayers lost as they transferred their wealth out of the Treasury to George Soros' hedge fund, and had to deal with higher prices of food, services and imports afterwards.

This trade also required quite a few tools, the biggest and most unlikely tool being capital. In this scenario, many people could have done the math, but not have had any way to monetize the information or the trade. In the Pareto Network, the information about this trade could have come from anyone with a passive interest in economics including:

- A student studying in University who has limited income or possibly massive debts
- A journalist for Bloomberg who has limited income or limited trading capital and may have difficulty collaborating with the right funds
- An analyst at an investment bank more focused on career highlights and growth than immediate profits
- A government employee at the Central Bank or Treasury that is otherwise powerless to end a nonsensical policy, but faces extreme disincentives (legal, continued employment, any other income stream) to disclose information

These people would disclose information to the Pareto Network. Holders of Pareto would receive the details of the information at a time delay proportionate to their ranking on the Pareto leaderboard, and take short positions. The market efficiency comes from

predicting that there will be limited buying pressure at this point in time, because the disclosure shows exactly how big the buying pressure will be: £27 billion pounds. As the bearish positions increase, all the people that went short first have greater profits, and want to be short sooner next time. This is still well before anybody outside of the Pareto system knows what information is being acted upon.

Pareto Holders can spend a fixed amount of their Pareto tokens on a tip to the provider of the information, and this action increases the Pareto Holder's ranking on the leaderboard, according to the ranking algorithm. The provider of the information is now compensated by everyone in the Pareto Network that has an interest in moving up the Pareto ranking, and the provider can sell the received Pareto tokens on the secondary markets.
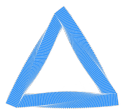
◢ SECONDARY MARKETS.

The utility of the Pareto token is that it allows access to information disclosures on the Pareto Network. The Pareto ranking algorithm is heavily weighted to owning and holding Pareto, which promotes scarcity of Pareto that would otherwise be available for trading. There are functions that promote the liquidity of a secondary market, providing ease of acquiring a position of Pareto and confidence that the market supports the price it was acquired at.

The price of Pareto will reach equilibrium at a level reflecting the perceived value of information available in the system. Any balance of Pareto above that equilibrium will be sunk capital, as it has a value which could be allocated in other valuable or potentially profitable opportunities. Holders who have reached the equilibrium will therefore sell off some of their Pareto on the secondary markets. Holders reach the equilibrium by making profits with their external

trading capital, based on the information they receive in the Pareto Network.

Another venue of liquidity will come from the Pareto token payments that content providers receive for disclosing information. These analysts and perceptive individuals often times will not be speculators, and will sell off their Pareto to people that want a greater position of Pareto.

Competition amongst the rankings will promote buying of more Pareto directly from the secondary markets, as well as paying content providers.
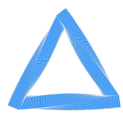
 # TOKEN ARCHITECTURE.

Token amount is finite and a total of 500,000,000 Pareto Exchange Tokens (PXT) will be created.

The Pareto (PXT) is divisible into units of 1/1,000,000 of a Pareto. These units are called Juran[4]. One million Juran equals one Pareto.

The Pareto is an Ethereum ERC20 compatible token that operates on the Ethereum blockchain[5]. Therefore, the underlying consensus mechanism supporting Pareto transactions is Proof of Work (POW) until such time as the Ethereum blockchain migrates to a Proof of Stake (POS) consensus mechanism.

Currently, the average block time on the Ethereum blockchain is well under one minute. Transactions in Pareto are of a nature such that this block time (and the resultant expected time for transaction confirmation) is considered to be well within desired time intervals.

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[4] Juran is reference to a philosopher in economics, Joseph M. Juran
[5] ERC20 Token Standard - https://theethereum.wiki/w/index.php/ERC20_Token_Standard

Examples of common transactions are a transfer of Pareto rewards to a Content Contributor and the spending (voting) of Pareto by a Token Holder with the intent to reward a valued Content Provider and effect an improvement in the Holder's ranking.

To deter spam in the kinds of information that is published, Content Providers must hold a stake of a predetermined amount of Pareto in order to be eligible to post content on the Pareto Network. In addition, there is a cost for publishing. It is possible to whitelist some content providers so that no stake and no spending is required. Initial content providers will be curated by the Pareto organization.

To address the possibility that the minimum Pareto holding is too high for a new Content Provider, Pareto holders can lease their Pareto for the benefit of the Content Provider. This enables the new Content Provider to participate by sharing some portion of their Pareto earnings with the sponsor.

CONCLUSION.

The Pareto Network is creating a new Ecosystem that will improve efficiencies in the generation and distribution of information of value to investors.

The Ecosystem will provide incentives and a mechanism for a wide range of individuals and organizations to create and share this information and subsequently receive compensation for their effort. It will broaden the range of available information and provide a market-based mechanism for investors to obtain access to information of value.

This Ecosystem will contribute to the rationalization of the market for blockchain-based investments and facilitate the more efficient allocation of capital within this revolutionary and rapidly growing sector of the global economy. In a more everyday, human context, it will allow those devoting their time and talents in this arena to benefit from Vilfredo Pareto's insight that a fraction of the inputs account for the majority of the results.

www.pareto.network