

# EchoLink – Blockchain Based Professional Networking and Recruiting Platform

Steve X. Chen\*  
EchoLink Team  
Palo Alto, California, USA  
steve@echolink.tech  
GitHub: <https://github.com/EchoLinkTech/Echo>

## Abstract

We introduce a blockchain based system of verified education, skill, and career information for individuals. The EchoLink System stores professional and other related information in an unalterable format on blockchains. The EchoLink System supports and provides access to multiple public, alliance, and private blockchains. All information is provided by trusted information authorities. The system saves businesses and other entities time and financial resources in recruiting, admission, vetting efforts while providing easy access to a pool of vetted candidates. The EchoLink System can be further extended to provide verified information in addition situations and industries, such as banking, finance, and insurance.



Figure 1: **ECHO** = Education + Career skills + Human capital + Opportunity; **Link** = Worldwide Network

**Contents**

<b>IMPORTANT NOTICE</b>	4
<b>DISCLAIMER OF LIABILITY</b>	5
<b>NO REPRESENTATIONS AND WARRANTIES</b>	5
<b>REPRESENTATIONS AND WARRANTIES BY YOU</b>	5
<b>CAUTIONARY NOTE ON FORWARD-LOOKING STATEMENTS</b>	8
<b>THIRD PARTY INFORMATION AND NO CONSENT OF OTHER PERSONS</b>	9
<b>TERMS USED</b>	9
<b>NO ADVICE</b>	9
<b>NO FURTHER INFORMATION OR UPDATE</b>	9
<b>RESTRICTIONS ON DISTRIBUTION AND DISSEMINATION</b>	10
<b>NO OFFER OF INVESTMENT OR REGISTRATION</b>	10
<b>RISKS AND UNCERTAINTIES</b>	10
<b>1. INFORMATION</b>	12
1.1. Global Education in the Age of Internet	12
1.2. Demand For Talent	12
<b>2. CURRENT ISSUES</b>	12
<b>3. OUR SOLUTION - ECHOLINK</b>	15
3.1. Advantages of Blockchain	15
3.2. Economic Incentives	15
<b>4. TECHNICAL IMPLEMENTATION</b>	16
4.1. Digital Identity and Credential Creation	17
4.2. Off Chain Data Sources	19
4.3. Dynamic Blockchain Browser	19
4.4. Multi-Blockchain Support	20
<b>5. ECONOMIC MODEL</b>	20
5.1. Token on EchoLink System - EchoLinkToken	20
<b>6. CONCLUSION</b>	21
6.1. Future Work	21
6.2. Acknowledgements	21
6.3. Whitepaper Versions	21
6.4. Code Base	21

**IMPORTANT: YOU MUST READ THE FOLLOWING DISCLAIMER IN FULL BEFORE CONTINUING**

The sale of the EchoLinkToken, the exchange medium to pay fees between users and other participants of the EchoLink System as detailed in this whitepaper (the “**Whitepaper**”) is only intended for, made to or directed at, only persons outside the United States of America and may be acted upon only by persons outside the United States of America. Moreover, this Whitepaper is not a prospectus or offer document of any sort and is not intended to constitute an offer of securities of any form, units in a business trust, units in a collective investment scheme or any other form of investment, or a solicitation for any form of investment in any jurisdiction. No regulatory authority has examined or approved of any of the information set out in this Whitepaper. This Whitepaper has not been registered with any regulatory authority in any jurisdiction.

By accessing and/or accepting possession of any information in this Whitepaper or such part thereof (as the case may be), you represent and warrant to EchoLink Foundation Ltd. (Company Registration No.: 201728041W) (the “**Foundation**”) that:

- (a) you are not a citizen, resident (tax or otherwise), person domiciled in, or green card holder of the United States of America;
- (b) you agree to be bound by the limitations and restrictions described herein; and
- (c) you acknowledge that this Whitepaper has been prepared for delivery to you so as to assist you in making a decision as to whether to purchase the EchoLinkTokens.

**IMPORTANT NOTICE**

This Whitepaper in current form is being circulated by the Foundation for general information [and to invite investor feedback only on the EchoLink System as presently conceived] **[#Dentons: Please confirm.]EchoLink: yes confirmed, very well put.**, and is subject to review and revision by the directors of the Foundation, the advisers, and/or legal advisers of the Foundation. Please do not replicate or distribute any part of this Whitepaper without this note in accompaniment. No part of this Whitepaper is intended to create legal relations between a recipient of this Whitepaper or to be legally binding or enforceable by such recipient against the Foundation. An updated version of this Whitepaper may be published on a date to be determined and announced by the Foundation in due course.

**PLEASE READ THIS SECTION AND THE FOLLOWING SECTIONS ENTITLED “DISCLAIMER OF LIABILITY”, “NO REPRESENTATIONS AND WARRANTIES”, “REPRESENTATIONS AND WARRANTIES BY YOU”, “CAUTIONARY NOTE ON FORWARD-LOOKING STATEMENTS”, “THIRD PARTY INFORMATION AND NO CONSENT OF OTHER PERSONS”, “TERMS USED”, “NO ADVICE”, “NO FURTHER INFORMATION OR UPDATE”, “RESTRICTIONS ON DISTRIBUTION AND DISSEMINATION”, “NO OFFER OF INVESTMENT OR REGISTRATION” AND “RISKS AND UNCERTAINTIES” CAREFULLY.**

**IF YOU ARE IN ANY DOUBT AS TO THE ACTION YOU SHOULD TAKE, YOU SHOULD CONSULT YOUR LEGAL, FINANCIAL, TAX OR OTHER PROFESSIONAL ADVISOR(S).**

The EchoLinkTokens are proprietary ERC20 Token Standard cryptographic tokens developed and issued by the Foundation to function as the native utility token used in the EchoLink System network as the means of value exchange, to power the EchoLink System and incentivise the keeper nodes of the EchoLink System network. “**ERC20 Token Standard**” means the set of criteria, (including criteria in relation to functions and events) developed by the Ethereum community, which has to be met in a smart contract on a blockchain in order to enable inter-operability across multiple interfaces and distributed applications.

The EchoLinkTokens are not intended to constitute securities of any form, units in a business trust, units in a collective investment scheme or any other form of investment in any jurisdiction. This Whitepaper does not constitute a prospectus or offer document of any sort and is not intended to constitute an offer of securities of any form, units in a business trust, units in a collective investment scheme or any other form of investment, or a solicitation for any form of investment in any jurisdiction.

This Whitepaper does not constitute or form part of any opinion or any advice to acquire, sell, or any solicitation of any offer by the Foundation to acquire any EchoLinkTokens nor shall it or any part of it nor the fact of its presentation form the basis of, or be relied upon in connection with, any contract or investment decision.

The Foundation will deploy all proceeds from the sale of the EchoLinkTokens to support ongoing development and growth of the EchoLink System network.

No person is bound to enter into any contract or binding legal commitment in relation to the acquisition of EchoLinkTokens and no cryptocurrency or other form of payment is to be accepted on the basis of this Whitepaper.

Any agreement as between the Foundation and you as a participant in the Token Sale, and in relation to any purchase of EchoLinkTokens is to be governed by only a separate document setting out the terms and conditions (the “**Token Sale Terms**”) of such agreement. In the event of any inconsistencies between the Token Sale Terms and this Whitepaper, the former shall prevail.

No regulatory authority has examined or approved of any of the information set out in this Whitepaper. No such action has been or will be taken under the laws, regulatory requirements or rules of any

jurisdiction. The publication, distribution or dissemination of this Whitepaper does not imply that the applicable laws, regulatory requirements or rules have been complied with.

There are risks and uncertainties associated with the Foundation and its business and operations, the EchoLinkTokens, the Token Sale, and the EchoLink System. Please refer to the section entitled "Risks and Disclosures" set out at the end of this Whitepaper.

This Whitepaper, any part thereof and any copy thereof must not be taken or transmitted to any country where distribution or dissemination of this Whitepaper is prohibited or restricted.

No part of this Whitepaper is to be reproduced, distributed or disseminated without including this section and the following sections entitled "Disclaimer of Liability", "No Representations and Warranties", "Representations and Warranties By You", "Cautionary Note On Forward-Looking Statements", "Third Party Information and No Consent of Other Persons", "Terms Used", "No Advice", "No Further Information or Update", "Restrictions On Distribution and Dissemination", "No Offer of Investment Or Registration" and "Risks and Uncertainties".

### **DISCLAIMER OF LIABILITY**

To the maximum extent permitted by the applicable laws, regulations and rules, the Foundation shall not be liable for any indirect, special, incidental, consequential or other losses of any kind, in tort, contract or otherwise (including but not limited to loss of revenue, income or profits, and loss of use or data), arising out of or in connection with any acceptance of or reliance on this Whitepaper or any part thereof by you.

### **NO REPRESENTATIONS AND WARRANTIES**

The Foundation does not make or purport to make, and hereby disclaims, any representation, warranty or undertaking in any form whatsoever to any entity or person, including any representation, warranty or undertaking in relation to the truth, accuracy and completeness of any of the information set out in this Whitepaper.

### **REPRESENTATIONS AND WARRANTIES BY YOU**

By accessing and/or accepting possession of any information in this Whitepaper or such part thereof (as the case may be), you represent and warrant to the Foundation as follows:

- (a) you agree and acknowledge that the EchoLinkTokens do not constitute securities of any form, units in a business trust, units in a collective investment scheme or any other form of investment in any jurisdiction;
- (b) you are not a citizen or resident of a country the laws of which prohibit or conflict with the Token Sale or your participation in the Token Sale;
- (c) you agree and acknowledge that this Whitepaper does not constitute a prospectus or offer document of any sort and is not intended to constitute an offer of securities of any form, units in a business trust, units in a collective investment scheme or any other form of investment in any jurisdiction, or a solicitation for any form of investment, and you are not bound to enter into any contract or binding legal commitment and no cryptocurrency or other form of payment is to be accepted on the basis of this Whitepaper;
- (d) you acknowledge and understand that no EchoLinkToken should be construed, interpreted, classified or treated as enabling, or according any opportunity to, tokenholders to participate in or receive profits, income, or other payments or returns arising from or in connection with the EchoLinkTokens or the proceeds of the Token Sale, or to receive sums paid out of such profits, income, or other payments or returns;

- (e) you agree and acknowledge that no regulatory authority has examined or approved of the information set out in this Whitepaper, no action has been or will be taken under the laws, regulatory requirements or rules of any jurisdiction and the publication, distribution or dissemination of this Whitepaper to you does not imply that the applicable laws, regulatory requirements or rules have been complied with;
- (f) you agree and acknowledge that this Whitepaper, the undertaking and/or the completion of the Token Sale, or future trading of EchoLinkTokens on any cryptocurrency exchange, shall not be construed, interpreted or deemed by you as an indication of the merits of the Foundation, the EchoLinkTokens, the Token Sale, and the EchoLink System;
- (g) the distribution or dissemination of this Whitepaper, any part thereof or any copy thereof, or acceptance of the same by you, is not prohibited or restricted by the applicable laws, regulations or rules in your jurisdiction, and where any restrictions in relation to possession are applicable, you have observed and complied with all such restrictions at your own expense and without liability to the Foundation;
- (h) you agree and acknowledge that in the case where you wish to acquire any EchoLinkTokens, EchoLinkTokens are not to be construed, interpreted, classified or treated as:
  - (i) any kind of currency other than cryptocurrency;
  - (ii) debentures, stocks or shares issued by any person or entity;
  - (iii) rights, options or derivatives in respect of such debentures, stocks or shares;
  - (iv) rights under a contract for differences or under any other contract the purpose or pretended purpose of which is to secure a profit or avoid a loss;
  - (v) units in a collective investment scheme;
  - (vi) units in a business trust;
  - (vii) derivatives of units in a business trust; or
  - (viii) any form of investment;
- (i) you are fully aware of and understand that you are not eligible to acquire any EchoLinkTokens if you are a citizen, resident (tax or otherwise), person domiciled in, or green card holder of the United States of America or a person who is located in the United States of America at the time of your intended purchase or purchase for of EchoLinkTokens in the Token Sale;
- (j) you are legally permitted to participate in the Token Sale and all actions contemplated or associated with such participation, including the holding and use of EchoLinkTokens;
- (k) the amounts that you use to acquire the EchoLinkTokens were not and are not directly or indirectly derived from any activities that contravene the laws and regulations of any jurisdiction, including anti-money laundering laws and regulations;
- (l) if you are a natural person, you are of sufficient age and capacity under the applicable laws of the jurisdiction in which you reside and the jurisdiction of which you are a citizen to participate in the Token Sale;
- (m) you are not obtaining or using EchoLinkTokens for any illegal purpose;

- (n) none of:
  - (i) you;
  - (ii) any person controlling or controlled by you; or
  - (iii) if you are a privately-held entity, any person having a beneficial interest in you;
- (o) you have a basic degree of understanding of the operation, functionality, usage, storage, transmission mechanisms and other material characteristics of cryptocurrencies, blockchain-based software systems, cryptocurrency wallets or other related token storage mechanisms, blockchain technology, and smart contract technology;
- (p) you are fully aware and understand that in the case where you wish to purchase any EchoLinkTokens, there are risks associated with the Foundation and its respective businesses and operations, EchoLinkTokens, the Token Sale, and the EchoLink System;
- (q) you bear the sole responsibility to determine what tax implications a purchase of EchoLinkTokens may have for you and agree not to hold the Foundation or any other person involved in the Token Sale liable for any tax liability associated with or arising therefrom;
- (r) you agree and acknowledge that the Foundation is not liable for any direct, indirect, special, incidental, consequential or other losses of any kind, in tort, contract or otherwise (including but not limited to loss of revenue, income or profits, and loss of use or data), arising out of or in connection with any acceptance of or reliance on this Whitepaper or any part thereof by you;
- (s) you waive the right to participate in a class action lawsuit or a class wide arbitration against the Foundation and/or any person involved in the Token Sale and/or with the creation and distribution of EchoLinkTokens; and
- (t) all of the above representations and warranties are true, complete, accurate and non-misleading from the time of your access to and/or acceptance of possession this Whitepaper or such part thereof (as the case may be).

#### **CAUTIONARY NOTE ON FORWARD-LOOKING STATEMENTS**

All statements contained in this Whitepaper, statements made in press releases or in any place accessible by the public and oral statements that may be made by the Foundation or its directors, executive officers or employees acting on behalf of the Foundation (as the case may be), that are not statements of historical fact, constitute "forward-looking statements". Some of these statements can be identified by forward-looking terms such as "aim", "target", "anticipate", "believe", "could", "estimate", "expect", "if", "intend", "may", "plan", "possible", "probable", "project", "should", "would", "will" or other similar terms. However, these terms are not the exclusive means of identifying forward-looking statements. All statements regarding the Foundation's business strategies, plans and prospects and the future prospects of the industry which the Foundation is in are forward-looking statements. These forward-looking statements, including but not limited to statements as to the Foundation's prospects, future plans, other expected industry trends and other matters discussed in this Whitepaper regarding the Foundation are matters that are not historic facts, but only predictions.

These forward-looking statements involve known and unknown risks, uncertainties and other factors that may cause the actual future results, performance or achievements of the Foundation to be materially different from any future results, performance or achievements expected, expressed or implied by such forward-looking statements. These factors include, amongst others:

- (a) changes in political, social, economic and stock or cryptocurrency market conditions, and the regulatory environment in the countries in which the Foundation conducts its business and operations, including the [·];
- (b) the risk that the Foundation may be unable to execute or implement its business strategies and future plans;
- (c) changes in interest rates and exchange rates of fiat currencies and cryptocurrencies;
- (d) changes in the anticipated growth strategies and expected internal growth of the Foundation and the EchoLink System network;
- (e) changes in the availability and fees payable to the Foundation in connection with its businesses and operations or in the EchoLink System network;
- (f) changes in the availability and salaries of employees who are required by the Foundation to operate their respective businesses and operations;
- (g) changes in preferences of users of the EchoLink System network;
- (h) changes in competitive conditions under which the Foundation operates, and the ability of the Foundation to compete under such conditions;
- (i) changes in the future capital needs of the Foundation and the availability of financing and capital to fund such needs;
- (j) war or acts of international or domestic terrorism;
- (k) occurrences of catastrophic events, natural disasters and acts of God that affect the businesses and/or operations of the Foundation;
- (l) other factors beyond the control of the Foundation; and
- (m) any risk and uncertainties associated with the Foundation and its business and operations, the EchoLinkTokens, the Token Sale, and the EchoLink System.

All forward-looking statements made by or attributable to the Foundation or persons acting on behalf of the Foundation are expressly qualified in their entirety by such factors. Given that risks and uncertainties that may cause the actual future results, performance or achievements of the Foundation to be materially different from that expected, expressed or implied by the forward-looking statements in this Whitepaper, undue reliance must not be placed on these statements. These forward-looking statements are applicable only as of the date of this Whitepaper.

Neither the Foundation nor any other person represents, warrants, and/or undertakes that the actual future results, performance or achievements of the Foundation will be as discussed in those forward-looking statements. The actual results, performance or achievements of the Foundation may differ materially from those anticipated in these forward-looking statements.

Nothing contained in this Whitepaper is or may be relied upon as a promise, representation or undertaking as to the future performance or policies of the Foundation.

Further, the Foundation disclaims any responsibility to update any of those forward-looking statements or publicly announce any revisions to those forward-looking statements to reflect future developments, events or circumstances, even if new information becomes available or other events occur in the future.



### **THIRD PARTY INFORMATION AND NO CONSENT OF OTHER PERSONS**

This Whitepaper includes information obtained from various third party sources (“**Third Party Information**”). None of the publishers of Third Party Information has consented to the inclusion of Third Party Information in this Whitepaper and is therefore not liable for Third Party Information. While the Foundation has taken reasonable action to ensure that Third Party Information have been included in their proper form and context, neither the Foundation, nor its directors, executive officers, and employees acting on its behalf, has independently verified the accuracy, reliability, completeness of the contents, or ascertained any applicable underlying assumption, of the relevant Third Party Information. Consequently, neither the Foundation nor its directors, executive officers and employees acting on their behalf makes any representation or warranty as to the accuracy, reliability or completeness of such information and shall not be obliged to provide any updates on the same.

### **TERMS USED**

To facilitate a better understanding of the EchoLinkTokens being the subject of the sale conducted by the Foundation, and the businesses and operations of the Foundation, certain technical terms and abbreviations, as well as, in certain instances, their descriptions, have been used in this Whitepaper. These descriptions and assigned meanings should not be treated as being definitive of their meanings and may not correspond to standard industry meanings or usage.

Words importing the singular shall, where applicable, include the plural and vice versa and words importing the masculine gender shall, where applicable, include the feminine and neuter genders and vice versa. References to persons shall include corporations.

### **NO ADVICE**

No information in this Whitepaper should be considered to be business, legal, financial or tax advice regarding the Foundation, the EchoLinkTokens, the Token Sale, or the EchoLink System. You should consult your own legal, financial, tax or other professional adviser regarding the Foundation and its business and operations, the EchoLinkTokens, the Token Sale, and the EchoLink System. You should be aware that you may be required to bear the financial risk of any purchase of EchoLinkTokens for an indefinite period of time.

### **NO FURTHER INFORMATION OR UPDATE**

No person has been or is authorised to give any information or representation not contained in this Whitepaper in connection with the Foundation and its business and operations, the EchoLinkTokens, the Token Sale, or the EchoLink System, if given, such information or representation must not be relied upon as having been authorised by or on behalf of the Foundation. The Token Sale shall not, under any circumstances, constitute a continuing representation or create any suggestion or implication that there has been no change, or development reasonably likely to involve a material change in the affairs, conditions and prospects of the Foundation or in any statement of fact or information contained in this Whitepaper since the date hereof.

### **RESTRICTIONS ON DISTRIBUTION AND DISSEMINATION**

The distribution or dissemination of this Whitepaper or any part thereof may be prohibited or restricted by the laws, regulatory requirements, and rules of any jurisdiction. In the case where any restriction applies, you are to inform yourself about, and to observe, any restrictions which are applicable to your possession of this Whitepaper or such part thereof (as the case may be) at your own expense and without liability to the Foundation.

Persons to whom a copy of this Whitepaper has been distributed or disseminated, provided access to or who otherwise have the Whitepaper in their possession shall not circulate it to any other persons, reproduce or otherwise distribute this Whitepaper or any information contained herein for any purpose whatsoever nor permit or cause the same to occur.

**NO OFFER OF INVESTMENT OR REGISTRATION**

This Whitepaper does not constitute a prospectus or offer document of any sort and is not intended to constitute an offer of securities of any form, units in a business trust, units in a collective investment scheme or any other form of investment, or a solicitation for any form of investment in any jurisdiction. No person is bound to enter into any contract or binding legal commitment and no cryptocurrency or other form of payment is to be accepted on the basis of this Whitepaper.

No regulatory authority has examined or approved of any of the information set out in this Whitepaper. No such action has been or will be taken under the laws, regulatory requirements or rules of any jurisdiction. The publication, distribution or dissemination of this Whitepaper does not imply that the applicable laws, regulatory requirements or rules have been complied with.

**RISKS AND UNCERTAINTIES**

Prospective purchasers of EchoLinkTokens should carefully consider and evaluate all risks and uncertainties associated with the Foundation and its business and operations, the EchoLinkTokens, the Token Sale, and the EchoLink System, all information set out in this Whitepaper and the Token Sale Terms prior to any purchase of the EchoLinkTokens. If any of such risks and uncertainties develops into actual events, the business, financial condition, results of operations and prospects of the Foundation could be materially and adversely affected. In such cases, you may lose all or part of the value of the EchoLinkTokens. Please refer to the section entitled “Risks and Disclosures” set out at the end of this Whitepaper.

## List of Figures

1	ECHO = Education + Career skills + Human capital + Opportunity; Link = Worldwide Network .....	[••]
2	Echo System Overview .....	[••]
3	P2P Encrypted Document Storage .....	[••]
4	Digital Identity Mapping .....	[••]
5	Off Chain Data Inputs Present More Information to End Users .....	[••]
6	Echo Browser: Search and Get Vetted Candidates .....	[••]

## 1. INFORMATION

In an information society, education, skills, and work experience lead to better career opportunities for individuals. Businesses increasingly seek out candidates with the right level of education and real world job skills. The need for high quality employees creates tremendous opportunities for people with the right education background, skills, and job experiences.

### 1.1. Global Education in the Age of Internet

The education industry is being disrupted by the Internet. The global e-education market has been growing at a [compound annual growth rate] of around 7.2% over the next decade to reach approximately \$325 billion by 2025. **[#Dentons: Please confirm.] EchoLink: confirmed as in the source cited.**

The size of the e-Learning market in the United States of America (the “U.S.”) was over USD 27 billion by 2016, owing to rising significance of these services across the region<sup>1</sup>. There are numerous other encouraging facts about the continuing growth and adoption in this sector.

Easy accessibility along with improvised effectiveness due to animated learning is likely to positively impact the size of the e-learning market. In addition, an increasing number of internet users coupled with an escalating number of internet enabled mobile phones are anticipated to propel industry demand [for e-learning] over the several upcoming years. **[#Dentons: Please confirm.]EchoLink: confirmed as in the source cited.**

On top of academic education, the online corporate training market [in the U.S.] is expected to grow by 13% per year, with 77% of U.S. companies offering online training to improve the development of their employees<sup>1</sup>. The era of e-education is truly upon us. In addition to academic training, skill training related to specific job requirements is also in demand. **[#Dentons: Please confirm.]EchoLink: confirmed as in the source cited.**

### 1.2. Demand For Talent

The economy of today is based on knowledge. As such, employers are increasingly looking for job candidates with a high level of skill. Be it language skills, IT skills, financial skills, or other service skills, skilled labour is highly sought after by employers.

Employers pay high amounts of referral bonuses or head hunting fees to acquire candidates with good skills. The recruiting industry generated USD 428 billion in revenue worldwide in 2016 (approximately equivalent to EUR 386 billion), with the U.S., Japan and the United Kingdom making up a majority of the revenue<sup>2</sup>. Online job sites, such as TaskRabbit, that cater to employers seeking certain skill sets for specific jobs are experiencing explosive growth. Employers are increasingly looking for and paying for employees with specific skill sets.

In today's competitive global market, employers are willing to spend a high percentage of their revenue to find the right employee with the appropriate skill set(s).

---

<sup>1</sup> LLP Accuracy Research. Global elearning market analysis trends industry forecast to 2025. [https://www.researchandmarkets.com/research/nv2b9g/global\\_elearning](https://www.researchandmarkets.com/research/nv2b9g/global_elearning), December 2016.

<sup>2</sup> Staffing Industry Analysts. Global staffing market achieves 428 billion in revenue. <http://www2.staffingindustry.com/eng/About/Media-Center/Press-Releases/Global-Staffing-Market-Achieves-428-Billion-in-Revenue>, 2017.

**In the case of LinkedIn:** Q3 2016 revenue was USD 960 million with 17% generated (USD 162 million) generated from premium account subscriptions, 18% (USD 175 million) from marketing solutions, and a staggering 65% (USD 623 million) from talent solutions<sup>3</sup>. According to LinkedIn, its talent solutions help corporate recruiters share, find, and engage the best talent. Corporate recruiter services provided by LinkedIn costs \$9,000 per year per seat (user login).

## **2. CURRENT ISSUES**

While demand for education and training has become global, academic and training institutions have nevertheless remained fragmented and isolated. Academic record verification and skill verification are cumbersome processes. In the U.S. and many other countries, there is no nationwide unified academic record system.

When it comes to job skill certification, such as IT skill certification, the process is even more fragmented. Degree certifications and grade reports can be altered, difficult to verify, or non-verifiable in many situations. Employers spend a significant amount of resources searching for candidates with the right skill set, and even more resources to check their references and verify their academic records and skill certifications.

All these problems can be solved with an immutable and verifiable blockchain based system.

In particular, the following areas are most affected by inaccuracies in education, skill, and employment history:

### **(a) Degree Inflation**

Inaccurate or false education and degree information being listed on resumes in order to gain employment or attain a high position in an industry. In a high profile case in 2012, Scott Thompson left the employment of Yahoo! as its chief executive officer after it was uncovered that he had embellished his academic credentials, ending his term at the company after just 4 months. ***[#Dentons: Please ensure that the example cited hereto is factually accurate lest person concerned retaliate with allegations of defamation.]EchoLink: confirmed as in the source cited. However, we have not independently verified the veracity of the source materials themselves.***

### **(b) Skill Inflation**

Certain specialised industries value and seek candidates with the right skill set. As a result, many applicants who apply for jobs in such industries will claim to have the requisite skills in their resumes. For example, as certain information technology skills become increasingly in demand, claims of applications possessing certain information technology certification in areas such as big data or artificial intelligence have become more common. It is entirely up to the employer to verify such claims. In situations where certification is provided by private organisations / academic institutions, verification of such academic credentials can be difficult.

### **(c) Job Experience Inflation**

Inaccuracies in job experience stated in resumes are not limited to certain sectors, but are pervasive across industries. The following are some of the more well-known

<sup>3</sup> Salman Aslam. LinkedIn by the numbers: Stats, demographics fun facts. <https://www.omnicoreagency.com/linkedin-statistics/>, 2017.

cases that took place in recent years<sup>4</sup>: ***[#Dentons: Please ensure that examples cited hereto are factually accurate lest person concerned retaliate with allegations of defamation.]EchoLink: confirmed as in the source cited.***

- (i) celebrity chef Robert Irvine lied about designing Prince Charles and Princess Diana's wedding cake<sup>5</sup>;
- (ii) an Massachusetts Institute of Technology ("MIT") dean never received any college degrees despite claiming to have a bachelor's and a master's degrees;
- (iii) Jeffrey Papows, president of IBM's software maker Lotus Development, fibbed about his academic and military background;
- (iv) top Wall Street analyst lied about studying at MIT when he actually attended Boston University. At one time, Salomon Smith Barney's Jack Grubman was Wall Street's highest-paid analyst with a salary of \$20 million per year;
- (v) former University of Notre Dame head coach lied about receiving a master's degree and being a football legend in college when he never even played a game;
- (vi) top Norwegian bureaucrat lied about being a registered nurse and having 2 degrees. She was sentenced to 14 months in prison; and
- (vii) Bausch & Lomb chief executive officer lied about his Masters in Business Administration ("MBA"). Ronald Zarrella had to forfeit his bonus of \$1 million when it was revealed that he never received his MBA from New York University as claimed. He commenced study of the programme, but did not in fact complete it;
- (viii) former Harvard University student Adam Wheeler fabricated Scholastic Aptitude Test (SAT) scores, letters of recommendations, and transcripts to gain admission and received \$40,000 in grants. Wheeler's true academic credentials were revealed when he attempted to apply for the Rhodes and Fulbright scholarships in his senior year.

(d) Cross Border Verification

The global number of students who study abroad continues to rise with an annual increase of 10%. There were almost 5 million international students in 2014. The Organization for Economic Co-operation and Development (OECD) has projected that, with demographic changes, the international student population is likely to reach 8 million by 2025<sup>6</sup>.

It is often difficult to ascertain information regarding degree or skill level certification across borders. It is also difficult to judge the quality of education for degree holders from abroad, with the exception of well-known universities.

(e) HR Verification Omission

<sup>4</sup> Business Insider. This is what happened to 10 executives who lied about their resumes. <https://goo.gl/qgWq8f>.

<sup>5</sup> Shirl; Keeler Janet; Reiley Laura 17 February 2008 Montgomery, Ben; Kennedy. Tv chef spiced up his past exploits. St.PetersburgTimes, 2008.

<sup>6</sup> Suzanne Shaffer. 10 study abroad statistics for you and your student. <http://www.parentscountdowntocollegecoach.com/2016/12/09/study-abroad-statistics/>, December 2016.

According to a 2016 CareerBuilder survey, 75 percent of employers had indicated that they had hired the wrong person for a position, and of those who had had a bad hire affect their business in the last year, resulted in costs of nearly \$17,000 incurred on average<sup>7</sup>.

Steven D. Levitt, the co-author of the book *Freakonomics* and an economics professor at the University of Chicago, cites research suggesting that more than 50% of job applicants lie on their resumes. Cover letters are notorious for embellishment and exaggeration<sup>8</sup>.

Though many employers are performing background checks, 75 percent of such employers have indicated that they had nevertheless hired the wrong person for the job. These employers say a bad hire has resulted in:

- (a) less productivity: 36 percent;
- (b) compromised quality of work: 33 percent;
- (c) lower employee morale: 31 percent;
- (d) lost time to recruit and train another worker: 30 percent;
- (e) cost to recruit and train another worker: 30 percent; and
- (f) employee's managers or co-workers had to spend excessive time assisting bad hire: 29 percent<sup>8</sup>.

Most importantly, the majority of employment related verification is done after the initial resume screening process or in-person interviews. Most pre-employment verification processes cost between \$5 to 65 per process<sup>9</sup>. Considerable time and effort are invested in the initial resume screening and interview processes, and would be wasted should the verification process discover any negative indicators. A resume screening system that offers verified education, skill, and job history would be invaluable to recruiters and save businesses time and financial resources. It would allow recruiters to precisely find candidates with the desired education, skill, and job history / background before spending valuable time and effort to engage the candidates.

### **3. OUR SOLUTION - ECHOLINK**

EchoLink is a blockchain network that connects students, education, and training institutions and industry participants. EchoLink is a blockchain based system of verified education, skill, and career information for individuals. The system, EchoLink, stores professional career related information in a hashed and unalterable format on public blockchains. All information is provided by trusted information authorities.

<sup>7</sup> CareerBuilder. More than 1 in 4 employers do not conduct background checks of all new employees, according to careerbuilder survey. <http://www.careerbuilder.com/share/aboutus/pressreleasesdetail.aspx?ed=12/31/2016&id=pr975&sd=11/17/2016>, November 17, 2016.

<sup>8</sup> Susan M. Heathfield. Do you know who you're hiring? <https://www.thebalance.com/do-you-know-who-you-re-hiring-1919148>, October 13, 2016.

<sup>9</sup> Ryan Howard. Cost of a background check: How much should you pay? <http://blog.verifirst.com/blog/bid/305407/cost-of-a-background-check-how-much-should-you-pay>, June 2, 2017.

**For students**, EchoLink stores student grades, degrees, and certificates in a protected and verifiable blockchain system. It provides student records to potential employers and higher learning institutions in a trusted manner.

**For academic and training institutions**, EchoLink provides them with the resources required to handle (provide and receive) degree and certificate verification.

**For businesses**, EchoLink provides a trusted source of candidate information that is not alterable. Academic records and skill certificates are associated with job candidates in a trusted way as they are supplied by the academic and training institutions directly, and are immutable.

### 3.1. Advantages of Blockchain

Traditionally, any kind of credential verification has depended on the issuing institution or other trusted authority to confirm the authenticity of a credential. This is a time consuming and costly process. If the issuing organisation has ceased to exist, records are lost and unverifiable. The blockchain provides a more robust solution in the form of a distributed network of recorded ledger. A blockchain cannot be easily altered or taken down, removes single points of failure, and ensures that records can be verified without any organisational dependency.

The blockchain logs transactions between parties, and can be used to verify:

- (a) existence of a record;
- (b) that a record has not been altered since its issuance;
- (c) the identity of the issuing institution;
- (d) ownership of the record; and
- (e) that the record has not expired or been revoked.

This is all done on a distributed and public system. All amendments and alterations of the record are also recorded in the distributed ledger, which provides a chain of evidence on the record as well.

Once a record, in the form of a smart contract on the blockchain, has been cryptographically created and recorded on the blockchain, it cannot be altered or spoofed. Any person attempting to impersonate an issuing institution will not be able to execute the smart contract. Decentralized key registries map keys and institutions across different industries.

### 3.2. Economic Incentives

The EchoLink System operates on public blockchains, which greatly reduces the cost of operating a similar system in a traditional web environment.

In the case of the Ethereum platform, with a properly written smart contract, the cost of execution is fixed at 21,000 gas. Given that the speed of transaction confirmation is not the most critical factor in the context hereto, the smart contract may be confirmed at a slower pace. When confirmation of transaction is done at around 60 seconds, the cost is at around USD 0.003 per record creation. For a sizable university, such as University of California,



Berkeley, with a graduating class of approximately 10,000 students, the cost of creating digital proofs of graduation for the entire class year is approximately USD 30 per year.

In the case of the NEO public blockchain, with an allocation of 10 free gas per smart contract, the EchoLink System essentially runs free of charge in most situations. This greatly reduces the cost of maintaining the system. [The economic benefits are shared with all the participants of the system.] **[#Dentons: Please confirm that there is no profit sharing element to the EchoLinkToken.] EchoLink: there is no profit-sharing element to the EchoLink Token (EKO) whatsoever! Please note: we standardize our token name to: EchoLink Token, symbol: EKO (already in Etherscan.io)]**

**For businesses** in particular, our system reduces the cost of verification, which directly translates into a reduction in cost of hiring.

**For academic and training institutions**, our system removes the burden of maintaining a verification system, which in most cases requires personnel and IT equipment. This amounts to savings to operational costs. In addition, our system passes a portion of the fees paid by businesses to issuing organisations. This creates a positive economic incentive for issuing organisations.

**For students**, our system makes their credentials credible. Potential employers put greater trusted in verified education, skill, and work experience. Our system injects a higher degree of seriousness in employer queries, and provides students greater exposure in the job market.

#### **4. TECHNICAL IMPLEMENTATION**

**Overview:** The EchoLink System consists of four major components, and offers heterogeneous and multiple blockchain support:

- (a) Digital Identity and Mapping System – translates digital identity to real world names and well known institutions;
- (b) On-chain Credential Creation System – supports batch creation and storage of credentials;
- (c) Off-chain Data I/O System – external data input and output from web, database, feeds, etc.; and
- (d) Multi-chain Data Browser for End User – intuitive interface to credential created and stored on a number of heterogeneous blockchains, such as Ethereum, AntShares, Metaverse, etc.

Identities of students and organisations in the EchoLink System are recorded on the blockchain in the form of public encryption keys. Certificate / degree info are created and stored onto the blockchain by issuing organisations directly. Certificate / degree information includes the digital identity of the corresponding student.

All information is stored on blockchain in an encrypted format. Through the EchoLink browser, users may find candidates matching certain attributes based on recorded certificate / degree information. Query results will be resolved by the naming service into a user-friendly readable format. Results are presented to the end user by the EchoLink browser.

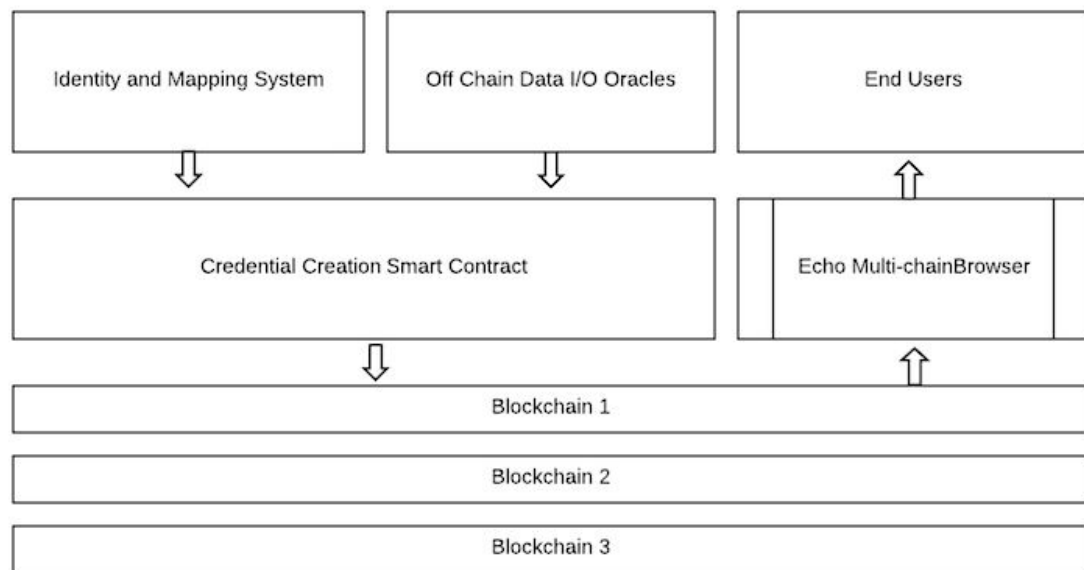


Figure 2: Echo System Overview

It is envisaged that all certificate / degree information will be entered into the system by the relevant issuing organisations, which lends to the credibility and integrity of the certificate / degree information.

**Note:** [Reference implementation] on Ethereum. The Echo system supports NEO, Dash, IOTA, and other blockchains. **[#Dentons: Please elaborate on this.] EchoLink: we will develop smart contracts that run on NEO, Dash, IOTA, and other blockchains.**

#### 4.1. Digital Identity and Credential Creation

The EchoLink System utilises public key (for example, Ethereum addresses) to identify entities in the EchoLink System. Each student is intended to hold a public key in the system. Each issuing organisation will also have a public key (in other words, account) in the EchoLink System.

Credentials creation involves the issuing organisation executing a smart contract that binds the issuer (for example, the academic institution) to the recipient (for example, the student) along with the corresponding credentials information. The smart contract acts as a proof of existence of the credentials on blockchain. Since the smart contract is executed by the issuer, we can be certain of the authority of such a credential.

##### 4.1.1. Digital Identity

Digital identities of the participants of the system are stored in the blockchain in the form of public keys. Students and known issuers will have a set of public keys that are recognised by the community. The public keys are used in the creation of credentials in the EchoLink System.

The EchoLink System provides a convenient way of mapping public keys to students, known issuers, and their accreditation. Business organisations pay a fee in the form of EchoLink token to access the mapping information of real world identities and public keys in the EchoLink System. **[#Dentons: Please confirm that the Echo coins referred hereto are the EchoLinkTokens.] EchoLink: thanks for pointing out: we should standardize to: the EchoLink token, and EKO. There is no such a thing, as the Echo coin.**

#### 4.1.2. Credential Creation

Issuing entities create credentials by executing smart contracts that set the status of the state of the smart contract. In the case of Ethereum, smart contracts with state information are time-stamped and stored in the blockchain. This mechanism creates an immutable proof of existence.

Issuing entities may include the recipient's public key address, degree information, or even hashed value of photographs and paper degree files into the blockchain. Even though the blockchain can be downloaded into a node and scanned, the information contained in the EchoLink System smart contract are only utilisable after resolution from the identity mapping service of the EchoLink System. The state information (in other words, credential details) is presented in user-friendly readable format through the EchoLink browser.

**P2P encrypted document storage** is utilised to store image and binary information associated with a certain credential. Once called upon, images and other binary files can be accessed by the EchoLink browser, thus providing the end user with a rich media experience accustomed to business users.

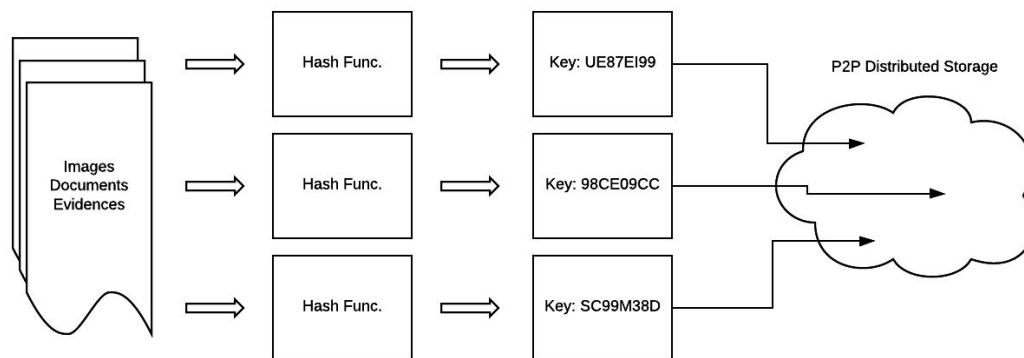


Figure 3: P2P Encrypted Document Storage

One method of implementing such off chain data feed is through [InterPlanetary File System ("IPFS")] **[#Dentons: Please confirm.]EchoLink: yes, as is implemented in the current public beta service. Should point out that other storage system might be used as well.** Images or files in portable document format (PDF) associated with the recipient are stored on IPFS. Hashed addresses of such documents are used in the smart contract that generates the credentials, thus linking additional documents to the credential.

#### 4.1.3. Digital Identity Mapping System

As stated above, digital identities of the participants of the EchoLink System are stored in the blockchain in the form of public keys. Since the EchoLink System is a system that is intended to provide trustworthy credentials, anonymity is not a requirement for the users of the EchoLink System. On the contrary, participants of the EchoLink System should make their identities known in order to respond to system queries.

The EchoLink System provides a mapping service to map public keys to identities of students and organisations. This mapping service is related to the EchoLink browser to the end users, and is transparent to the end user. Only during the presentation of query results submitted by the end user, would the mapping service resolve the identities of the public keys and present human-readable information to the end user.

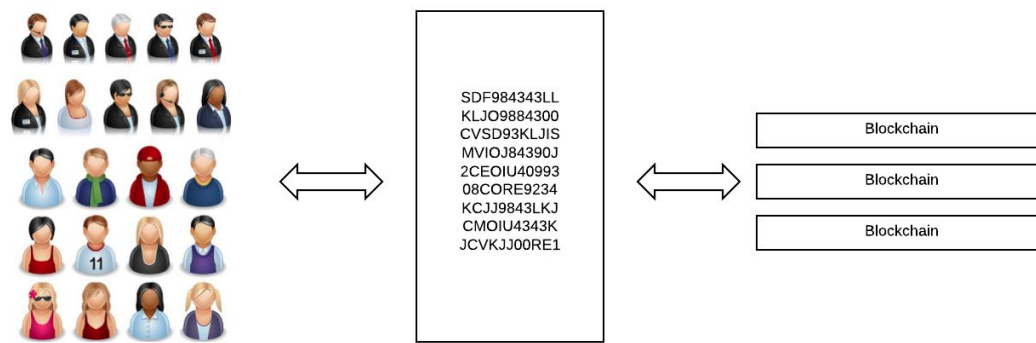


Figure 4: Digital Identity Mapping

#### 4.2. Off Chain Data Sources

In the EchoLink System, only digital identities of the issuing entity and the recipient are required to constitute a verified credential on the blockchain. In reality, more information may be provided in order for the credential to be useful the user, providing more insight.

Besides digital identities, other important information regarding a person's credentials include academic records, course work transcripts, detailed degree information, and skill certification information. This information will be accessible to queries through "oracles" (in other words, off chain data sources).

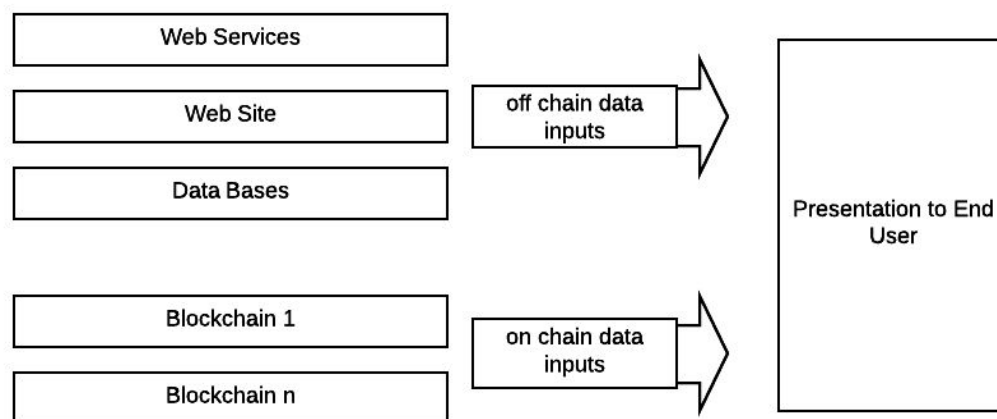


Figure 5: Off Chain Data Inputs Present More Information to End Users

Furthermore, through dedicated oracle services, more information sources, such as web services, may be linked to the smart contract.

#### 4.3. Dynamic Blockchain Browser

The primary end users of the EchoLink System are primarily intended to be business organisations and recruiters. A user friendly blockchain browser would be essential to business users.

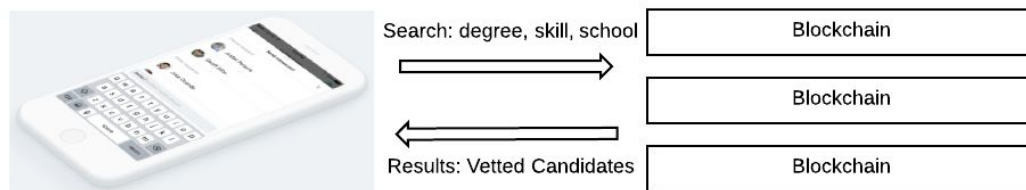


Figure 6: Echo Browser: Search and Get Vetted Candidates

Ideally, the EchoLink browser would combine functionality of both a blockchain explorer and an EchoLink wallet. Business users search candidates through the blockchain functionality and pay fees through the wallet functionality, all in the same browser application.

#### 4.4. Multi-Blockchain Support

It is envisaged that EchoLink System users will span the globe. The EchoLink System is intended to serve students from various countries studying abroad. Businesses recruiting internally may also use our system to find the best talent worldwide. The EchoLink System will eventually need to provide support for data stored on different blockchains operating on different technology platform and countries.

The EchoLink System operates through smart contracts for credential creation on various blockchains. Blockchain platforms that offer support for smart contracts with Turing-complete virtual machines can be used as the underlying blockchain layer for the EchoLink System. (for example, Ethereum, NEO, and Dash). Although not necessary, blockchains that offer oracle access to off chain data would be more compatible with EchoLink premium features, such as graphical credential certificates.

The mechanism to establish multi-blockchain support is through the EchoLink browser. It is the end user interface for smart contracts to multiple back-end blockchains. The nature of the supported blockchain can be a public ledger, alliance ledger, or even private ledgers. The EchoLink browser provides a readable and user friendly interface to multiple blockchains.

### 5. ECONOMIC MODEL

As indicated earlier in the paper, large amounts of financial resources and personnel are spent on acquiring talent by businesses around the world. On average, each user of LinkedIn's corporate recruiter service pays \$9,000 per year. LinkedIn generated a staggering \$623 million from such solutions in Q3 of 2016 alone. The need to find the right job candidate is the fundamental economic driver of the EchoLink System.

The fees paid by business users contribute to the health of the EchoLink System. A portion of the fees are distributed to education and training organisations as incentives to provide verified information. A portion of the fees also contribute to the actual upkeep of the EchoLink System.

#### 5.1. Token on EchoLink System – EchoLinkToken

The EchoLink System provides an exchange medium to pay fees between users and other participants of the system in the form of the EchoLinkToken (symbol: EKO). With support for heterogeneous back-end blockchain data sources in the EchoLink System, a common exchange medium is needed. The EchoLink smart contract and multi-blockchain browser

have built-in support for the EchoLinkToken across different blockchain systems. Therefore, data providers from public blockchains, alliance blockchains, and even private blockchain would be easily rewarded with EchoLinkTokens.

An even more important use of the EchoLinkToken is to establish an international education reputation and skill level market place. With the EchoLinkToken as the common method of value exchange in the EchoLink System, quality of education in different countries, institutions, and disciplines can be measured by a common and consistent token.

## **6. CONCLUSION**

The EchoLink System is a user focused blockchain application system, and is designed from a user perspective. The EchoLink System supports multiple blockchain platforms across countries. It addresses an acute business need, namely identifying great talent with verified credentials at a reduced cost. The EchoLink System is driven by real-world economic needs and is built on top of a sound economic model.

Furthermore, The EchoLink System breaks down barriers between education systems, credential verification systems, and value systems to bring out a truly trusted and worldwide talent market.

### **6.1. Future Work**

We plan to further strengthen the EchoLink System by focusing on the following areas:

- (a) next generation of end user access and interaction: both mobile and desktop;
- (b) more industries support in addition to talent and education; and
- (c) education credential valuation market based on EchoLink System users voting.

In addition to improvements to the EchoLink System, the same design principle can be utilised to create blockchain based notary, transaction, and proof of existence system for other industries.

### **6.2. Acknowledgements**

We would like to acknowledge several industry veterans for advising our project.

### **6.3. Whitepaper Versions**

Echo v. 1.0 – April 2017, initial release

Echo v. 1.1 – July 2017, first updated draft

Echo v. 1.2 – October 2017, second updated draft Echo v. 1.3 – November 2017, third updated draft

### **6.4. Code Base**

Codebase: <https://github.com/EchoLinkTech/Echo>

**[#Dentons: You may also wish to consider including in this Whitepaper:]**

- (i) more information on token generating event, the function(s) of the token, and future plans for the EKO; and
- (ii) *the risk factors which we have included in the Token Sale Terms.] EchoLink: yes, when the whitepaper, we might include a link to the token sale in this section. When first written, the token sale was not finalized yet.*