

According to a recent report by the European Commission, blockchain technologies may "disrupt institutional norms in the field of education and empower learners" in line with the needs of Industry 4.0. The Commission proposes eight scenarios for the application of distributed ledger technology (DLT) in an educational context, based on the current state of technology development. This book, made available thanks to the "Erasmus for Entrepreneurs" program, looks into the theoretical and practical aspects of the "Open Source University", a project announced in 2016 as one of the "Top 10 Social Innovation Ideas" by Hewlett Packard Enterprise's "Living Progress Challenge". OS.UNIVERSITY aims to create a distributed platform on the blockchain that turns the potentially disruptive scenarios into real-life opportunities for modernization of Academia, enablement of businesses, and empowerment of students, employees, life-long learners. Though a set of "smart contracts", deployed on the platform, the main issues in the information-coordination relationships among the key stakeholders are being addressed, setting the foundations for what the author foresees as "Academia 4.0".



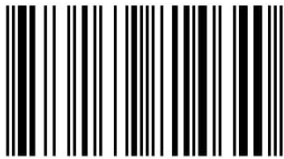
Hristian Daskalov

Academia 4.0: University on the Blockchain

The Path of a Disruptive Innovation.
From Research to Implementation.



Co-Founder & Project Lead at the "Open Source University", building world's learning and development ledger on the blockchain. Co-Founder of the Center for Open Science at the Technical University of Sofia. Awarded as "2017 Best Doctoral Candidate" by the Minister of Education and Science in Republic of Bulgaria. Expert at Brain Workshop Institute.



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**The path of a disruptive innovation
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**Center for Shared Science & Business
Technical University of Sofia**

Imprint

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OPEN SOURCE UNIVERSITY

*“Education is the most powerful weapon,
which you can use to change the world.”*

(Nelson Mandela)

“Academia 4.0: University on the Blockchain”

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Technical University of Sofia



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DEDICATION

I dedicate this book to all who contributed writing it, starting with Prof. Ognyan Andreev, Director of the Department of Industrial Management at the Technical University of Sofia and supervisor of my doctoral research, as well as Mr. Gordon Kerr of Cobden Partners with whom we worked in London as part of the “*Erasmus for Entrepreneurs*” program in order to move this research out of Academia and closer to the real-world’s needs of educators, learners, and businesses.

I would like to thank to the entire team of the Open Source University project, among which the co-founders and key developers of the OS.UNIVERSITY platform from “ReChained” Ltd., our academic, corporate and community advisors, our global brand ambassadors, our early adaptors and partners from Brain Workshop Institute, the University of Finance, Business & Entrepreneurship, JobTiger & JobTiger Recruitment, Investor Media Group and many other innovators from around the world who continue to support the great project that I have the honor to lead and to describe in the pages ahead.

Last, but not least, thank you to a global community of more than sixty thousand members, engaged with the project through the variety of social networks that we leverage. This book is for every learner around the world, especially for those to whom life seems extraordinary difficult at moments. As Stephen Hawking once said, however difficult life seems, there is always something you can do and succeed at - it matters that you don't just give up, so stay curious and keep learning.

To those that think they know it all, and do not see the point of going through the pages (many from the academic world and the blockchain industry may find themselves in this category), I would like to remind them the words of one of the greatest futurist writers, Mr. Alvin Toffler:

“The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn.”

Cheers!
Hristian

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LIST OF ABBREVIATIONS

B2A	<i>Business-to-Academia smart contract</i>
B2L	<i>Business-to-Learner smart contract</i>
BOINC	<i>Berkeley's Open Infrastructure for Network Computing</i>
BWI	<i>Brain Workshop Institute</i>
CSF	<i>Critical Success Factors</i>
DAG	<i>Directed Acyclic Graph</i>
DAO	<i>Decentralized Autonomous Organization</i>
DApp	<i>Distributed Application</i>
DLT	<i>Distributed Ledger Technology</i>
EdTech	<i>Educational Technology</i>
EDU	<i>OS.UNIVERSITY token tag (equivalent to EDU-X)</i>
ERC20	<i>"Ethereum Request for Comment" Standard for Smart Contracts</i>
ERP	<i>Enterprise Resource Planning System</i>
EU	<i>European Comission</i>
EY	<i>Ernst & Young</i>
HCD	<i>Human-Centered Design</i>
HE	<i>Higher Education</i>
HPE	<i>Hewlett Packard Enterprise</i>
HR	<i>Human Resources</i>
ICO	<i>Initial Coin Offering</i>
IoP	<i>Internet of People</i>
IoT	<i>Internet of Things</i>
IPFS	<i>The InterPlanetary File System.</i>
IPO	<i>Initial Public Offering</i>
IT	<i>Information Technology</i>

L&D	<i>Learning & Development</i>
L2A	<i>Learner-to-Academia smart contract</i>
MIT	<i>Massachusetts Institute of Technology</i>
MOOC	<i>Massive Open Online Course</i>
MRC	<i>Monetary Research Center</i>
OECD	<i>Organization for Economic Cooperation & Development</i>
OSS	<i>Open Source Software</i>
OSU	<i>Open Source University</i>
P2P	<i>Peer-to-Peer</i>
PMI	<i>Project Management Institute</i>
SDG	<i>Sustainable Development Goal</i>
STEM	<i>Science, Technology, Engineering, and Mathematics</i>
TU	<i>Technical University</i>
VCS	<i>Version Control System</i>
VUZF	<i>University of Finance, Business & Entrepreneurship</i>
WEF	<i>World Economic Forum</i>
B2A	<i>Business-to-Academia smart contract</i>

FOREWORD

By Gordon Kerr, Founder and CEO of Cobden Partners ¹

I met with the author in 2012 during the opening year of the Sofia Business School, a high-profile summer program on management of global economic risks, organized by the “Reform Union Club” (Sofia) and the New Bulgarian University. Hristian, a moderator at the School back then, was actively supporting the international team of academic and corporate lecturers, among whom were some of the key members of “Cobden Partners”.

In 2017, when the OS.UNIVERSITY project that Hristian started back in 2015, along with his colleagues, moved from research and early prototyping to active development, I had the honor to be invited to join as an independent advisor and share my experience with the team on how to build a sustainable operating model around what is a global social innovation solution. It was the EU-funded “Erasmus for Entrepreneurs” program that gave us the opportunity to work together in London, including on the publication of this book, so that the OS.UNIVERSITY project can reach its key stakeholders.

Who are these key stakeholders, though, and what does the project offers to them? This is what I want to outline in these opening pages:

1. Academic and other providers of training and certification, benefiting from:
 - Leaner, more transparent and cost-effective credentialing model;
 - Competitive advantage, achieved through the global blockchain-enhanced learning and development marketplace;
 - Higher learner retention and engagement by gamifying the learning experiences through smart contracts.
2. Students, employees, life-long learners, pursuing development opportunities:
 - Indisputable accomplishments and achievements - validated and verified through the blockchain, showcased worldwide;
 - Exclusive educational opportunities, based on distributed learning pathways, curated by Academia and businesses;

¹ Cobden Partners U.K. offers professional, unconflicted, independent advice in the field of strategic management, monetary policy, prudential regulation, mandates and incentive schemes for financial regulators and central bankers, and corporate governance regulation as it applies to financial firms. Its team consists of bankers and consultants with expertise in regulatory capital, renowned scholars and distinguished economists.

- Exclusive employment and professional development opportunities, based on sophisticated matching algorithms.

3. Business and other organizational representatives, gaining:

- Instant access to a global pool of talent with traceable credentials, enabling smarter recruitment;
- Performance-based hiring and career advancement, enabled through smart contracts, incentivized by rewards;
- Global opportunities for corporate learning and development on demand without scalability constraints.

While the book outlines the changes in the academic and broader educational world, emphasizing on OS.UNIVERSITY as a gateway to “Academia 4.0”, the project itself is a perfect way for companies to attract and develop talents with the right set of skills, at the right time. Therefore, this book is far from a theoretical, purely academic writing. By going through the outlined research, development, and community inputs, structured carefully page-by-page, it is my understanding that we need this “Open Source University” of tomorrow - today! We need its open and distributed model for learning and development, but most of all – we need its open attitude when it comes to addressing today’s change and uncertainty in an instant, collaborative manner.

Image 1. Gordon Kerr meeting the team of OS.UNIVERSITY at its headquarters in Sofia.



Source: Project archive, a work meeting to arrange the scope and timeline of the “Erasmus for Entrepreneurs” acceleration exchange in London, United Kingdom. (2018)

PREFACE

To make readers feel more confident about what they will (and will not) find in the pages ahead, I would make the following observations about each of the three parts of this book:

- **Part One** – it is research oriented, based on three separate papers, building on each other - peer-reviewed and published as part of the proceedings of international scientific conferences that have taken place in Bulgaria, Latvia, and the Czech Republic throughout 2017.
- **Part Two** – it is technology oriented, based primarily on the original technical white paper that explains the ed-tech solution behind the overall research and development effort, i.e. OS.UNIVERSITY.
- **Part Three** – it is community oriented, based on blog and other articles, coming from project's blog, social and news media, concerning OS.UNIVERSITY and its traction when it comes to its practical implementation and the change that it brings to the L&D eco-system.

The three parts are coordinated in such a manner in order to tell the story of the OS.UNIVERSITY journey "*from research to implementation*", starting with foundational research and ending with feedback from the community.

Within each of the parts and their chapters, there are sub-sections, which are either more philosophical or more practical. Some of the more philosophical writings are available on my personal blog at www.daskalov.info, dating back as early as 2013 when the process of conceptualizing around the need for an “Open Source University” began.

The identified underlying need (the “Why?” question) is related to a broad set of social phenomena and changes in the economy around us. As an example, Toffler believes that along with the transition to the “third wave”, the mass character of the current socio-economic setup will disappear from many aspects of our lives and be replaced by customized forms of communication, education and entertainment, consistent with the unique desires of individuals. OS.UNIVERSITY enables for this mass customization to occur within the academic world, thus it is at the center of the outlined research.

OS.UNIVERSITY as a solution is the answer to the “What?” question. Given that learning to manage the change is vital to avoid crisis and the governmental mismanagement following it, this book has a lot to offer. The book looks at a certain project from every possible managerial angle – from planning to execution and implementation of the end software product.

As a general rule, the systems that are unwilling to adapt to the new realities inevitably become turbulent and shaky, eventually being substituted (or at least challenged) by more convenient forms of organization (e.g. private and digital money vs. state-owned/central banking). Therefore there is also a strong focus on the tactic and operational aspects (that is the “How?” question). However, it should be noted that the operational details around OS.UNIVERSITY and its mode of operation (as outlined within the book) are open to discussion. They will always be, as it is an open source project, open to change in every possible aspect.

Changes occur on a daily basis - it may happen so that the book becomes outdated soon after its publication. In order to avoid loss of relevance, a Git-based version of this reading will be made available for the community to actively engage with and contribute when it comes to maintaining and enriching. While such a liberal approach on academic writing is far from Academia’s mainstream, I appreciate the open-ended nature of this work the most, as I believe that science operates a lot like a parachute – it works best when open.

As George Bernard Shaw once wrote:

“If you have an apple and I have an apple and we exchange these apples then you and I will still each have one apple. But if you have an idea and I have an idea and we exchange these ideas, then each of us will have two ideas.”

Oddly enough, the apple metaphor is a good example for the double-spend problem that the blockchain addresses – every remote transaction of value becomes indisputable once recorded on the distributed ledger. Ideas, however, are intended to multiply when shared. So I look forward to your feedback and I leave it up to the reader to make the next move upon completion of the last page – share your feedback and let’s write the next chapter for “Academia 4.0” together!

The Author,

London 2018

INTRODUCTION.

TO BUST, OR NOT TO BUST? WHAT IS NEXT FOR ACADEMIA?

Given that we speak of a ‘University on the Blockchain’ as a next chapter in the evolution of Academia, it is no surprise that in this short introduction to the broader subject, i.e. the future of Academia, I will speak of banking and finance. Blockchain’s original use-case - Bitcoin², was centered around the democratization of this particular industry, so let’s use it as a parallel to ours.

We can start the parallel by discussing why the housing market in the U.S. basically turned into a bubble and eventually went bust, along with the banking system that was inflating it; the primary cause of the 2007/8 recession. It’s simple – it ended up this way because it broke its linkage with the common sense of doing business in an entrepreneurial economy, turning itself into a deceptive, yet not-so-clever instrumental bundle of financial services to hedge funds, investment banks and their ecosystem, .

The problem with the higher education market is more or less the same. Without clear focus on providing real value to the end-user, it slowly turns itself into nothing more than an inflated balloon, serving and pursuing its own internally oriented reasons of existence, just as any other self-sufficient system does. In my introduction to the topic, provoked by a TV documentary in which I was invited to take part (I also recently gave an interview on the subject³), I examine two of the key aspects of the problem:

1. **The key deficits** afflicting the higher education market today;
2. **The root cause** behind those deficits which many institutions and groups in our society prefer to disregard - the lack of proper skills and efforts in the area of strategic higher-education management, both at systemic and institutional levels.

We address the issues, starting with an effort to understand the core principles behind why a university would operate as such and why it is of use to society and the economy as an agent. To start with let me clarify a few things.

² Bitcoin is a cryptocurrency that runs on a global peer-to-peer network, it’s decentralized, it’s open source, bypassing middlemen/central authority, has no issuer or acquirer, anyone with a computer/smartphone can use it.

³ Available at: <https://www.divident.bg/bulgaria/1034-obrazovanieto-e-sila-energiya-koyato-ne>.

First, I do not want to present general solutions while discussing the problems. But when the stakes are that high, some ideas should be spoken out loud - clear enough for all to consider, no matter if directly applicable in a particular use-case or not. Because as mentioned above, the subject affects us all.

Second, I do believe that higher education should not be elitist. And that the educational market can (and should) grow further, as long as it grows on the basis of common economic sense and on the principles of openness and inclusiveness.

Any learner should have the opportunity to pursue any type of education that fits his vision and plans for the future – whether that would be liberal arts education or of technical character; in a full or a part-time programme; in a private- or state-owned academic institution.

Figure 1. Current limitations in opportunities when it comes to colleague graduation.



Source: The Pell Institute for the Study of Opportunity in Higher Education. (2013)

I do not seek to reinvent the way this system works. There are far more simple things that can be done, starting with re-discovering its original meaning and purpose, but adapting it to the new realities. Because, really, what is the University (as an institution) if not a classical intermediary, a medium intended to connect knowledge surplus and knowledge deficit agents?

And if you substitute ‘*knowledge*’ with ‘*finance*’, you would understand that this otherwise bizarre definition is extremely close to the classic “*financial intermediary*” definition. And that the more those institutions run away from their initial operating design, the more unpleasant consequences are to follow. They need to intermediate, but as a smart grid, not as stand-alone towers.

Put differently, the moment universities decide to follow another agenda, different from enabling and successfully conducting knowledge transfer, they start to cut off the branch they have been sitting on for centuries. If not to facilitate the knowledge transfer towards the end-user (whether that be the student – *through his studies*, the business – *through applied research*, or the society – *through fundamental research*), what other value-generating model could there be for an academic institution?

To emphasize my point, let us try to figure out what such an alternative model (that we can apply to Academia, just as the modern day banking system tried to apply for itself) would look and sound like. Actually, let us just implement what banks decided to specialize in over the last few decades and foresee what would happen with the Academia if it is to follow such a pattern.

If universities were to operate as modern banks, they would specialize in issuing a type of securities – call them *higher ed. diplomas* (of *Bachelor's, Master's and Doctor's* class), backed by the governments, which in our “figurative example” would serve a rather unique multi-faceted role – that of regulators, rating agencies, and financial exchange operators all together.

As the traditional economic function of securities' purchase would be to serve as an investment with the view to receiving income and/or earning capital appreciation, (and as this investment vehicle is the only one of its class that is approved by the regulator), then a certain group of investors (let's call them *students*), would be really interested to invest in such a financial scheme (with borrowed money, that is) in order to then trade and profit. This “secondary trading” would occur on a market where another class of investors (known as *employers*), would be eager to get hold of such investments that would potentially pay off. A hypothetical pay-off that would come in the form of improved quality and productivity of work, performed by the graduates.

In our “purely figurative model” (if you follow the metaphor carefully enough) businesses would actually be investing in a derivative product, an asset-based security, the value of which is derived from (and collateralized by) the pool of underlying assets, the so-called – *pool of graduates*. Pooling the assets into these derivative financial instruments would allow the risk of investing in the underlying assets to be diversified as the security now represents just a fraction of the total value of the diverse pool of underlying assets.

If the “purely hypothetical model” sounds more and more familiar to you, then you would rightly guess, based on the banking industry collapse, that:

- (a) The risk is diversified only on paper;
- (b) The risk eventually is dispersed over the entire economy.

Not only that, but the consequences also get transferred throughout the entire society and become quite obvious for the taxpayers when it becomes clear that there isn't necessarily an underlying value behind the tradable financial assets. This is because the initial issuers have made all the wrong investment calls, similar to the other stakeholders along the chain.

Going back to where the example started (as it is now clear that we are describing not a hypothetical scenario, but what the world of Academia is actually turning into), there is one key element remaining undiscussed. And that is the question “*Why is this happening?*“. What is the root cause behind this situation that we are facing today? Why are many of the universities (even the best and brightest of them) turning into “Enron”-avatars?

It is because nowadays higher education institutions constitute a multi-billion dollar industry, which is just entering into the age of volatility, uncertainty and complexity, while continuing to operate in the same old monopolistic manner under governmental protection, ensuring that no disruptive agents would be able to penetrate the higher ed. market and endanger their establishment positions.

Understanding the ambiguity of the situation, however, many universities are starting to hedge against risks of financial losses in a number of ways. And even though not all of those “paths to salvation” provoke exotic parallels with the financial industry and its collapse, this overall move is leading towards an insurance-based survival strategies, causing universities to bet on superficial, yet influential characteristics, rather than to concentrate on what really matters – knowledge transfer and its optimization.

This is what is causing the shift of focus in the wrong direction and what is turning the entire *enrolment-through-graduation* process more and more into something resembling a capital raising exercise, intended to finance the new “core” operations, linked to universities’ revenue-generating institutional image and prestige; superficial prestige that allows institutions to sell promises, instead of assets.

To back this bold conclusion, let us take for example the conveyor-type research paper production pattern, serving a research journal industry, worth >\$20 billion (STEM only). This happens in the era of what should be the “*Golden Age of open education, science and innovation*”. What this closed and self-sufficient production model means in practice, is that a scholar is now working to fulfil a norm that is not oriented towards students’ interests. Instead, scholars become oriented towards their (and their institutional) impact-factors. In a nutshell, preserving institutional self-interests is becoming more important than preserving and improving on what this institution is intended to provide.

I cite the publishing industry as an example, because it is probably the most modest example of all. Broadly speaking, there are far worse models, which some academic institutions use in order to justify what many of them have transformed into. From getting into the business of printing diplomas to rejecting and diminishing opportunities in order to ensure exclusiveness (as if we are speaking of golf clubs and not of learning and development communities).

Having considered that, one starts to think. Only if there was a way to bring back in the spotlight the deeper, more meaningful sources of value behind the university diploma – the knowledge acquired, the skills and competences mastered...

As mentioned many times so far, there is a way. But it involves dissolving the centralized institution mindset when speaking of higher education. That is right – the University of Tomorrow should be perceived as a medium, a network, not a fortress, nor an ivory tower. Nobody would remain isolated in an ivory tower if everyone around him were to operate in an open market, competing and cooperating with other educational and research agents, with networks and clusters of partners, providing a diverse range of educational services.

In fact, it is in the interest of the very higher education institutions that lag behind, to start and broadcast this discussion. Again, there is a parallel with the banking/ housing market wobbles, a number of misspoken systemic malfunctions, backed by false governmental incentives and interventions, ensured a feeling of “sustainability” behind the self-sufficiency of the system and led to its collapse.

Different to what happened back in 2008, there would be no second chance for the Academia in case of a bust. A house will always be a house and provide accommodation to start with – the basic source of value, to sustain the demand and supply relations, vital for the market's existence after 100, or 100 000 years... Meaning that the market will always be there. But will the University, as an organization, the way we know it nowadays, remain the only source, the monopoly provider of higher education and research services in the 21st century?

Do we really believe that even in a generation's time we will continue to gather and process information (*knowledge and professions as derivatives*) by means and forms of organization as we did in the 18th or 19th centuries? I am personally not so sure about it and therefore can conclude that as long as this market remains a subject of systemic logic deficits, its sustainability is questionable, therefore there are risks to see it as a busting bubble the moment the key stakeholders withdraw their trust, and stop investing in it. And the many alternatives arising out of the Internet, are just making this chain-of-events almost irreversible.

My message to those, who are on the side of the university education as something of value (such as me), would be to do the following in order to avoid the worst-case scenario for Academia in distress:

1. **Remove barriers to and within higher education** – country borders and accompanying national regulations mean nothing to knowledge and science in the information era and has never meant anything when speaking of ideas, of human progress beyond borders.
2. **Remove the institutional monopoly around higher education** – deregulating and opening the higher education market for alternative forms of operation that do not necessary fit into the governmental perception of what a university should look like, would be a game-changer. Recognizing the value behind what collaborative networks of academic, business and NGO stakeholders are already offering to their members, partners, supporters, would mean that everyone would be able to choose what type of higher education to pursue – institutional, pan-institutional, hybrid. Especially now when there are millions of high quality resources waiting to be harvested online, but requiring formal support in many ways, incl. in recognizing the achievements of learners.

3. **Help classic universities adapt to the new reality** – this change will help them become more competitive and vital, rather than destroy them. And if this is not the case, then how is preserving a system, incapable to keep pace with the rest of the world, helping the students, society, nations? The main shift of thinking required is for universities to no longer think of themselves as the higher education market monopolists, but rather than to embrace a role of educational marketplaces – were the constituting stakeholders meet, collaborate, exchange ideas, value...

In other words, University's future is where its foundations are laid. To succeed in the next century, it should go back to its basics and rediscover its meaning, while modernizing its means of operations. This book provides only one of the possible scenarios on how to do so. A scenario that builds on more than 3 years of dedicated research and at least on 5 more years of work that I put in as a representative and a leader within the academic community, during my years as a representative of the students' community in Bulgaria.⁴

Image 1. Presenting early work, related to the present book, in front of student leaders.



Source: Project archive. (Sofia, 2014)

⁴ As part of my higher education advocacy background, I have served as a member of the Academic Council of NBU, have led University's Students Union, representing a student community of 12 000+, and have served as a Secretary General of the National Students Union, representing 50+ universities. Among the main campaigns I have led, are for implementing the European HE Quality Charter in Bulgaria and ensuring it is being enforced whenever that was needed – in a court case against the Ministry of Education, attempting to protect the rights of 30,000+ part-time university students; during a country-wide campaign, leading to a public policy expansion to cover the costs of university sports programmes for 50 000+ additional students. Another campaign was for the establishment of a national EU-funded investment programme for education and research.

PART 1.
FOUNDATIONAL RESEARCH

“The future is already here – it is just not very evenly distributed.”

(William Gibson)



Receiving the National Award for Best Doctoral Candidate from the Minister of Education & Science of the Republic of Bulgaria in December 2017, in recognition of the research work around the “Open Source University” project, outlined within the present chapter. This reward is a collective achievement of the entire team of OS.UNIVERSITY, which is behind the development and the implementation of the project beyond pure theory. The book you are holding reflects on the progress achieved – it is a powerful tool to distribute the knowledge acquired and the lessons learned.

After the positive reviews earned by the Open Source University project and the expansion of its partnership network in 2016 (under programs for entrepreneurial support, led by the Ministry of Economy and the Open Society Institute, as well as through the Sofia Business School global masterclasses) 2017 proved to be an extremely successful year for the OS.UNIVERSITY (as we will refer to it), which kicked-off back in 2015 as an initiative of the “Brain Workshop Institute” (BWI). From an academic perspective, the project was peer-reviewed by some of the leading technology institutes within the European scientific community and was featured in academic journals across Bulgaria, Latvia and the Czech Republic. OS.UNIVERSITY was among those open innovation solutions to address the challenges of Industry Revolution 4.0., discussed during 2017 annual conference of the global Society of Open Innovation, based in South Korea, which publishes the open access journal “Open Innovation: Technology, Market, and Complexity”.

Image 2. Riga’s annual gathering of the Society of Open Innovation, hosted by RTU.



Source: Project archive. (Riga, 2017)

The same for the “Perspectives on Entrepreneurship Development in the Digital Age” conference, attended by leading university and industrial representatives from the CEE region, at Brno University of Technology (The Czech Republic) where I, as a project lead behind OS.UNIVERSITY’s overall R&D efforts, presented my work on the subject of managing stakeholders’ engagement in open source and social innovation projects, showcasing the project as a one-of-its-kind hybrid innovation. A research that is shared within the current chapter.

Image 1. Discussing the project in Brno with a representative of FH Bielefeld, Germany.



Source: Project archive. (Brno, 2017)

The project was featured in Riga, Latvia once more, during the 58th international scientific conference of Riga Technical University (RTU) where the topic of discussion was the involvement of Academia in social innovation for sustainable development with OS.UNIVERSITY as a best practice. OS.UNIVERSITY's intention to introduce the world's first distributed academic & career development ledger on the Ethereum blockchain, received a warm welcome during the annual conference of the Monetary Research Center (MRC) in Sofia in October 2017, having been presented in a panel discussion with senior officials, academicians and investment professionals from around Europe.

Image 3. Introducing the project the Bulgarian academic community at UNWE, Sofia.



Source: Project archive. (Sofia, 2017)

Last but not least, The Open Source University team had the honor to speak at the first of its kind pan-Slavic conference at Sofia University (“SlavConf” 2017), and provide insights on how technology innovation in the field of distributed computing can actually create new opportunities within all of the non-technical fields of science, humanities and arts included.

Image 4. Lecture on “Technology Innovation in Humanities” at Sofia University, SlavConf.



Source: Project archive. (Sofia, 2017)

Apart from those few highlights from 2017, the renowned experts, constituting OS.UNIVERSITY advisory team, had the opportunity to promote a solution that has the potential to revolutionize the way 7 billion people develop academically and grow professionally on numerous high-profile international forums, such as “Autonomy 2017” in Paris and the “The Next Big Thing” conference in Sofia.

Additional opportunities for academic representatives to meet the OSUni team and discuss the development of the project during its crowdfunding stage were made available in November & December 2017, among them the “Open Alt” conference in the Czech Republic—a perfect opportunity for open source enthusiasts to get to know the project and get on board.

As you will see below, the research overview ends with a chapter, setting the foundations for the project’s white paper - a guiding document for the practical implementation of OSUni. The research itself, however, covers an area that is far broader, spanning over time theories, such as the critical success factors (CSF) theory and the stakeholder management theory.

Open source is simply the applied field, chosen in order to enable better understanding of how these particular projects can operate effectively, i.e. what are the key success factors in managing the relations with the stakeholders and within the network of stakeholders on a peer-to-peer basis. Why is this important? Well, in recent decades, we have seen a growing interest in IT projects, based on open source - from the development of system and application software to even the hardware industry. Today, open source is the basis of some of the most successful software products - operating systems, web servers, web browsers, different content management systems, database technologies, businesses applications and many others. Despite its growing presence and influence in the tech world, the study of managing open source projects remains limited.

Considering that the core of open source is the participation of different stakeholders and the principle of voluntary sharing and cooperation, efficient management of this participation becomes a key condition of project objectives. This in turn defines critical success factors exploration as a main problem of interest – what is the set of requirements that are most important to the successful management of relationships between stakeholders and the project.

In view of the relevance of the theme and the importance of the issues touched, stakeholder management in open source projects is defined as an object of study, with critical success factors as subject of research. The aim of the research is by studying the existing theory and practice, to derive and analyze (from relational and significance perspective), the set of critical success factors in managing stakeholders in open source projects, so that these can be applied to OS.UNIVERSITY as a next-generation open source initiative.

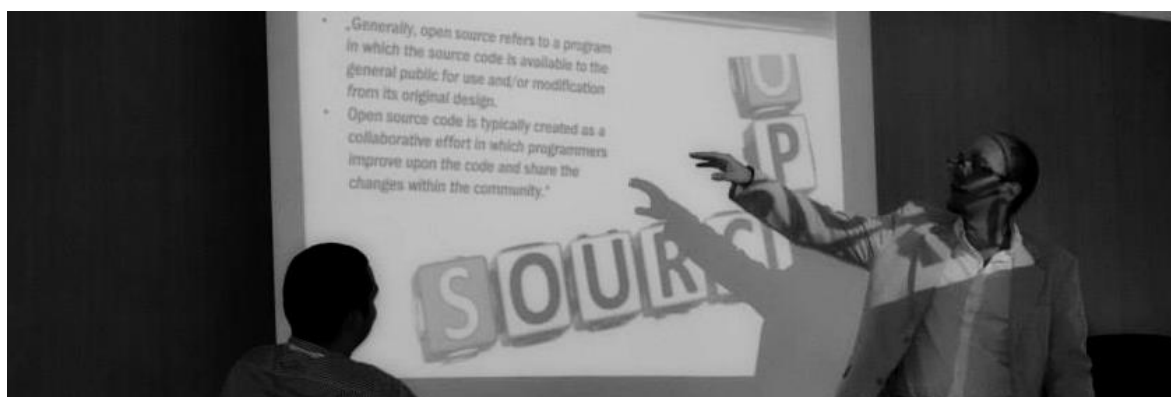
The central thesis is that there is a specific set of critical success factors in the management of project stakeholders, applicable to open source projects, and that these particular factors can be classified in order to improve the management of such projects, enhancing their application and distribution further into the world of IT and beyond that – in Academia, in social enterprise, even in manufacturing.

The first time I was offered the chance to speak on the subject was in front of the great audience of “SOFIMUN” Conference back in 2013. The acronym stands for Sofia International Model United Nations, the biggest and most prestigious such international youth event held in the country for quite some time.

Basically, an event, part of a global United Nations simulations network, in which a diverse pool of international participants (students and young professionals) take on the roles of foreign diplomats and debate contemporary international matters, while networking and getting to participate in a number of social, cultural and academic events.

I myself am an ex-MUNer, having previously received the Most Diplomatic Delegate Award in 2008/9 National Model. My participation in similar events on a Balkan level, in the Baltics, Belgium (during my student's years) had made me a big supporter of the cause. Going back to the subject, in 2013, as a guest lecturer, I spoke on the topic of applying the open source principles beyond the Internet, in Academia. Since these days blockchain, as a technology, has always struck me simply as a means to achieve this bigger goal.

Image 5. Lecture on the application of open source model for opening-up Academia.



Source: Project archive. (Sofia, 2013)

In general, 'open source' refers to "a computer program in which the source code is available to the general public for use and/or modification from its original design". Open-source code is typically "a collaborative effort where programmers improve upon the source code and share the changes within the community so that other members can help improve it further". Getting obvious from its description, the open source concept (or principle) has far broader social implications than the purely developer's side of the story.

My first vital point at SOFIMUN 2013 covered the issue of the contemporary global crisis that has spread in different branches for the last several years. The current state of global economic development, 10 years after the collapse of the financial sector in U.S., has clearly proven that there is a lack of proper crisis

management in a sector, which is resistant to change. I also argued that not only the state of the financial sector in 2008 mattered, but also the mismanagement disaster to follow. In combination, they led to a mixture of serious problems for the future generations to handle with. Because printing money, producing wealth out of thin air, is only more of the same that caused the bubble to burst once. And would definitely cause it to burst once more at a later point in time, but stronger.

Coming to my main point, I made the parallel from the introduction, connecting the ‘big picture’ with a particular social system that massively lags behind and just as the financial system – rejects to admit it and change. The education, that is. Rooted in the 19th century reality, the traditional mass education concept is so heavily outdated that it simply cannot serve the needs we have in regards to the current and future challenges we are facing – on the labor market, in science, in politics, etc.

Image 6. Explaining the ‘knowledge triangle’ and the need for a smarter connecting layer.



Source: Project archive. (Sofia, 2013)

Based on recent studies, we now know that employers seek a lot more in their employees in terms of interpersonal and intellectual skills, flexibility, abilities to take more responsibility and to analyze more complex tasks, far beyond what was expected from them as part of the routine mass production processes of the past. The current education system, however, has only limited to offer, in order to satisfy those raising demands. It basically fails to adapt to the new reality, in terms of development of practical skills and in terms of overall humanitarian learning.

I offered therefore a possible resolution to the problem, introducing to the audience the open source concept of education. The open source educational institutions and programmes would bring all the pieces together, because they would endorse knowledge of human culture and the world, building on personal and social responsibility, but at the same time would infuse the young generation with passion for technology and life sciences.

All based on the fairly simple idea that we learn, we create businesses, we get inspired by collaborating and exchanging ideas, we seek and find solutions to the problems we are facing together, and we therefore constantly try to re-shape our reality and its limitations. And every system that puts boundaries to collaboration slows down the exchange of information, therefore it is doomed to collapse under its own weight.

Hence, it is in the interest of traditional education itself, to adapt to the open source principles in the face of that powerful threat of being no longer required and eventually substituted. That would have sounded exaggerated, if it weren't for the new platforms for open education, which make the classic unadaptable and unwilling to change universities obsolete, if not today, then in 10 to 15 years' time.

What was described as "*The best part of the guest lecture*", by the reporters, observing the Model and drafting the annual SOFIMUN Journal, was the fact that "*all these theoretical proposals made, actually do find their implementation in reality*".

As I pointed out in front of the audience, there are a number of open source best practices that currently exist in educational institutions around the globe, covering a number of areas, such as the different learning communities, the common intellectual experience projects, community-based learning programmes. Nevertheless, what they all lack is economy of scale.

Unfortunately legislatures do not always do their best to enable the wider implementation of such innovations in mainstream education. In fact, governmental institutions and programmes tend to do quite the opposite – to protect the status quo which once worked, but currently fails to deliver any results whatsoever, surrounding it with a protective net of policies, rules and procedures.

So what would the best solution be? Advocating for incremental innovations, I have always been in favor of a step-by-step transition from one model of social organization to another, especially when sustainability and social convenience matter. Therefore, I would not recommend changing the hardware and software of modern education overnight. In a market where we have the state monopolist, whose hardware and software products lag, but are pre-ordered for each and every user, their technology overpriced and obsolete, but protected by licenses and regulations, what practical steps should be taken? This is a question that I brought to the attention of the SOFIMUNers, and a question that I raise in this book once again.

Grass-root initiatives, incremental innovations – these can inspire change, multiply and co-exist, until the stage is set for the bigger developments to happen. The example with which I backed-up my main point then was the “Find a Friend @ NBU” Programme, which I established at New Bulgarian University in 2010-2012 period, while I was part of the Academic Council of the NBU, and a Chairman of the Students’ Council. The pilot programme, limited in budget and institutional support at first, offered more than 200 freshmen the possibility to connect and to learn from their colleagues. This way, a crucial base for a university-wide learning community was set, where students from different academic, personal, and professional backgrounds not only received, but also contributed with new knowledge, playing a valuable role in its natural dissemination.

All of that was enabled by an online platform, whose primary purpose was to popularize the project and serve as its back-office, as I believe online platforms or networks should be an extension, an enabler, of our face-to-face communication and collaboration, not an alternative. The same with online education, of course. One idea leading to the other, I came to the concept of OS.UNIVERSITY, but plenty of work needed to be done before it advanced. I concluded my lecture emphasizing the fact that already aware of the shifting processes in our present-day society, students can only benefit from the open source forms of education. Later during the same year, mine was the opening speech at the 1st International Summer University Science Conference in Albena, building on the subject, with my academic report “*Towards An Open Source Educational System*” officially published as part of the proceedings. This was when the broader research that is outlined below began.

CHAPTER 1

MANAGING STAKEHOLDERS' ENGAGEMENT IN SOCIAL INNOVATION – LEARNINGS FROM THE OPEN SOURCE WORLD

Originally presented by the author under the title of “Managing stakeholders’ engagement in social innovation projects – learnings from the online world of open source innovation” and published as part of the proceedings of selected papers from the 16th International Scientific Conference “Perspective of Business and Entrepreneurship Development in Digital Age”, hosted by Faculty of Business and Management, Brno University of Technology, September 20-22, 2017, Czech Republic. The data, analyzed within the article is collected within the “Modern Research Methods: Theory and Practice” course at Riga Technical University, led by assoc. prof. Karine Oganisjana, for the purposes of the fourth stage of the broader research project 5.2.7. “Involvement of the Society in Social Innovation for Providing Sustainable Development of Latvia” of the National Research Programme (NRP) 5.2. “Economic Transformation, Smart Growth, Governance and Legal Framework for the State and Society for Sustainable Development – a New Approach to the Creation of a Sustainable Learning Community” at the Ministry of Education and Science of Latvia.

1.1 Research Overview

While failure rates remain a significant challenge for open source projects, there is a great opportunity for social innovation projects to learn from the online world when it comes to raising the levels of stakeholders’ engagement. With more than 15 million open source contributors worldwide, the purpose of the article is to draw from the learnings on how to engage contributors and apply those learnings to implement better, more efficient and effective solutions to social problems.

Based on previous findings from the open source innovation body of knowledge, a directed qualitative analysis is used within the current research to analyze interviews with social innovation stakeholders in Latvia and identify the set of applicable practices/elements/areas that are perceived to be of high importance to the successful engagement of key stakeholder groups when it comes to implementing social innovation projects.

By seeking to connect the findings from interviews with social innovation stakeholders in Latvia and the broader theoretical framework, concerting factors, perceived to influence engagement levels in open source innovation projects, the research aims to enable cross-pollination of best practices and bridge the gap between the physical and online worlds of managing collaborative innovation. As a result of the qualitative content analysis, it was found that factors, perceived as leading to successful management of stakeholder engagement in open source innovation projects, are also considered to be of relevance in the case of social innovation. Based on this finding, a set of best practices from the open source world was suggested for implementation in the key areas identified.

The research confirmed that the main set of factors for successful engagement of project stakeholders is not limited to a particular country, stakeholder or project group. A need for broader efforts in the area of cross-pollination of knowledge, originating from the digital and the physical worlds, was found to be of importance in the current case and in general. Such cross-pollination is projected to play an ever more important role in business and entrepreneurship development in the digital age, especially in the dawn of the 4th industrial revolution, characterized by the fusion of technologies that is blurring the lines between physical & digital.

Image 7. Presenting the findings in front of students at Brno University of Technology.



Source: Project archive. (Brno, 2017)

1.2 Research Introduction

▪ Research Problem

Social innovation⁵ attracts the attention of researchers, entrepreneurs, policy makers, practitioners, governmental and nongovernmental organizations, individuals in Latvia and beyond as it is considered to be a relatively new concept to be studied and promoted for the sustainable development of society (Oganisjana et al., 2015). Its rising popularity is due to one other important reason - social problems are complicated, context-dependent, and cross-boundary in nature (Dobele, 2015). And with the rise of the globalization-driven changes in today's technology-enabled economy (e.g. global value chains, distributed production, dispersed project teams, etc.), solving these problems effectively and efficiently by a single individual or organization, is no longer the case, hence the need for open collaboration.

Similar to social innovation, the decentralized development model of open source projects encourages open collaboration (Levine & Prietula, 2013). A main principle of open-source development projects is peer production, with products such as source code, design blueprints, and documentation freely available to the public - another similarity between both types of innovation activities, the outcomes of which are not intended to be internalized, but rather to be of use to as many stakeholders as possible. In fact, a diverse range of innovative social solutions, developed for marginalized communities across the world, are based on open source software (Bhatt et al., 2016), which in that sense can be viewed as both a form of social innovation, and a tool for social innovation.

While there exists much research dedicated to the success of social innovation initiatives in general (Clark et al. 2008; Caulier et al., 2010) and open source innovation projects (Crowston et al., 2003; Mattila & Mehtonen, 2013), including many on the subject of the underlying success factors and measures on environmental, organizational, and individual level, less attention is paid to the operational aspects of achieving such success – how to manage the processes, what needs to be done in one or another key area, etc.

⁵ In the context of the current article, social innovation will be defined as “*better, more efficient and effective solutions of social problems resulting in new self-sustainable social practices and culture for sustainable development of the society*”. This definition is used by the research team behind the project to which this study is associated - “*Involvement of the society in social innovation for providing sustainable development of Latvia*”.

This is a problem of great importance as despite the general agreement on what and where to look at, failure rates remain high, especially in open source initiatives where the greater sum of projects are reported either inactive or failed (Mattila & Mehtonen, 2013). While in the case of social innovation, countries such as Latvia are still struggling to cope with the lack of data and measurement to advance forward (Dobele, 2015).

▪ **Research Questions**

Defining the research questions in the current chapter was based on the general importance of the research problem, as well as on an in-depth review of the empirical data gathered for the purposes of the research project.

More than 20 interviews with representatives of NGOs, businesses, and public institutions were conducted by graduate students from Riga Technical University, confirming that passivity and low level of support from stakeholders are considered to be among the main barriers to social innovation projects in Latvia⁶.

This in addition to similar findings from previous studies, served as a solid foundation for the decision to address the problem by shedding light on the following two questions:

- *Question 1:* What are the key areas to focus on when engaging society's main stakeholders in resolving social problems through social innovation projects?
- *Question 2:* What collaborative innovation practices can be applied in the areas that are most commonly recognized as important?

Based on the numerous similarities with open source innovation projects - in their nature, barriers and success drivers, it was hypothesized that open source research would provide a useful framework to describe the key areas to focus on when engaging society's main stakeholders in resolving social problems, and that the importance of those areas will be recognized throughout different stakeholder and project groups.

⁶ Similar barriers are reported throughout literature to stand on the way of open source innovation projects. Next to that, similar reasons are being named for starting social and open source innovation projects – either an interesting idea occurring on personal level with potential for implementation, or a topical social problem that is identified and that needs to be solved.

1.3 Research Framework

In recent decades, we have seen a growing interest in IT projects, based on open source - from the development of system and application software to even the hardware industry. Today, open source is the basis of some of the most successful software products worldwide - operating systems (e.g. Linux), web servers (e.g. Apache), web browsers (e.g. Firefox), content management systems (e.g. WordPress), a wide variety of business apps (e.g. OpenOffice).

Figure 1. A list of popular open source projects within the IT world.

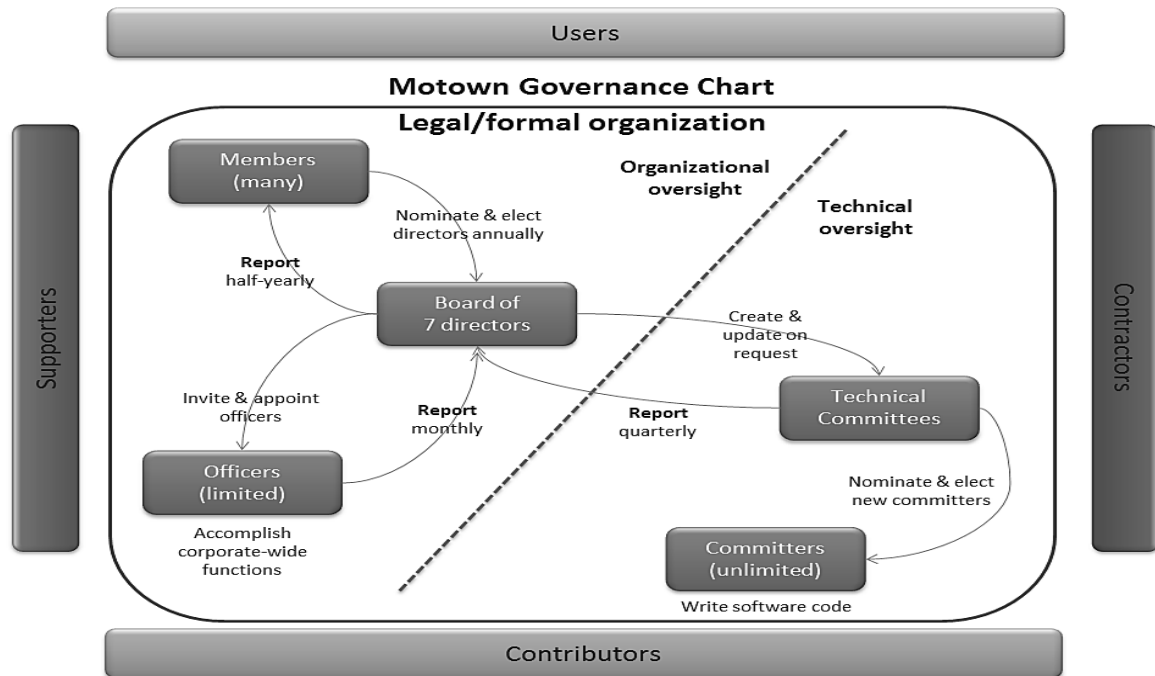


Source: Open Source Initiative. (2015)

Blockchain technology projects are only the latest generation of open source innovation. Considering that the core of these and other open source initiatives is the participation of different stakeholders on the principle of voluntary sharing and cooperation, efficient management of their engagement becomes a key governance condition, leading to the achievement of project objectives.

This in turn defines critical success factors⁷ (CSFs) exploration as a main problem of research interest with some scientific publications dedicated especially on this complex subject (Aksulu & Wade, 2010).

Figure 2. OSS governance model, demonstrating the complexity of stakeholder interactions.



Source: The “Motown” open source project. (2016)

Based on the findings from the open source innovation body of knowledge, the directed qualitative analysis within the current research article will enable us to identify a set of applicable areas that are perceived to be of high importance for the successful engagement of key stakeholder groups within society when it comes to solving social problems. The analysis, intended to bring both worlds together, in line with the direction of blurring the lines between the physical and the digital worlds, set by the 4th Industrial Revolution (Schwab, 2015), will be conducted under the following assumptions, associated with the categories (Table 1), which are to be tested for applicability⁸.

⁷ Rockart (1979) defines CSFs as those limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance, i.e. successful engagement of society in solving social problems (in our case). It is stated that those critical areas/elements should receive constant and careful attention from management, hence they are the source for best practices implementation when it comes to managing engagement.

⁸ These categories are derived from a set of critical success factors identified as part of researcher’s dissertation “*Research on Critical Success Factors in Open Source Projects’ Stakeholder Management*”. The aim of the dissertation is by studying the existing theory and practice, to derive and analyze from relational and significance perspective, the set of critical success factors in managing stakeholders in open source innovation projects.

Table 1. CSFs for stakeholders' engagement in open source innovation projects.

Category	Context
<i>Legal strategy</i>	Includes all that is required to enable project's success by creating, adapting and complying with the comprehensive legal framework that surrounds the projects. Both inward- and outward-oriented strategies apply ⁹ .
<i>Contextual awareness</i>	Requires raising the understanding of the surrounding environment and the embedded problems and opportunities. It may include conducting preliminary research, coalition-building efforts as foundation for sustainability of the project, awareness of the marketing and other key contextual elements of the project, beyond the implementation of project's core activities.
<i>Value-oriented communication and collaboration</i>	Suggests understanding of the drivers for participation in the project and the existing value-creation models from personal and broader social perspective. It requires two-way communication within the broader stakeholder community, including active promotion of the mechanisms and benefits of solving the problem in an innovative manner.
<i>Community building agenda</i>	Consists of measures, oriented towards nurturing community's identity (belonging and common values), organizing and conducting common events, providing mentoring, support, and opportunities for growth.
<i>Openness in project practices</i>	Stands for openness and transparency, surrounding the project, demonstrated through communication, documentation, online presence, how business matters are being run, among others.
<i>Coherent contributor engagement strategy</i>	Means that recruiting newcomers to ensure sustainability of the project community, with clear responsibilities assigned, should be preceded by a problem-oriented basis for the project, and resonating mission statement, intended to activate the various stakeholders.

⁹ An inward-oriented strategy in case of open source projects may include trademark protection measures, project licensing and managing its implications, attracting and managing financial donations, etc. While an outward-oriented strategy would tend to influence the institutional context, in which the project is taking place.

<i>Strategic project setup</i>	Defines a consistent planning and execution, sometimes beyond the lifecycle of the project. From strategizing and commitment around achieving project's goals to implementation of the right governance/decision-making model, this strategic setup requires application of proven management practices and a comprehensive network strategy.
<i>Comprehensive tackling of intra- and intergroup conflicts</i>	Speaks for the need of a project leadership that addresses group interests within the community, perceived to be conflicting, and manages growth (and growth-related challenges) successfully. Apart from the managerial implications of intra- and intergroup conflict resolution, a project lead would also need to rely on charter-based governance for stronger control in conflicting situations.

Source: Own research. (2017)

Apart from those organizational factors in open source practice, there are a number of technical areas for teams to focus on, which are not in the scope of the current research, given the non-technical nature of social innovation projects that are being analyzed. When it comes to looking at the greater variety of social innovation initiatives that exist, specific development and/or system lifecycle success factors may apply, depending on the projects under consideration.

Image 8. “JobTiger Recruitment” engagement with the OS.UNIVERSITY project is based on value-oriented communication and collaboration, focusing on mutual integration benefits.



Source: Project archive, work meeting between the teams. (Sofia, 2017)

1.4 Research Methodology

The interviews that are subject to qualitative content analysis were conducted in order to reveal how to involve society in the solution of social problems. The research team of the project “*Involvement of the society in social innovation for providing sustainable development of Latvia*” within National Research Programme “EKOSOC-LV” conducted a survey on social innovation, with the help of graduate students from Riga Technical University.

The particular question of interest from within the questionnaire - “*In your opinion, what is to be done to involve the society in the solution of social problems?*” was open ended, allowing the researcher to gain deep understanding of the answers provided, including through review of the responses to related open-ended questions, such as “*What to your mind is to be done to find better new solutions for social problems?*”.

Given the fact that the goal of a directed approach to content analysis is to validate or extend conceptually a theoretical framework or a theory, it is normal that the same is guided by a more structured process, compared to the conventional approach (Hickey & Kipping, 1996). The process that was followed, is described by Hsieh and Shannon (2005), and consists of the following steps:

- Using prior research and existing theory, we begin by identifying the set of key concepts as the coding categories to use.
- Operational definitions for each category are defined using the theory.
- As the goal of the research is to identify and categorize all instances of a particular phenomenon, the all relevant interviews are reviewed and relevant text is highlighted.
- All highlighted passages are coded using the predetermined codes¹⁰.
- Any text that cannot be categorized with the initial coding scheme is given a new code, i.e. new categories are being developed.
- Newly identified categories either offer a contradictory view of the phenomenon or further refine/extend/enrich the theory.

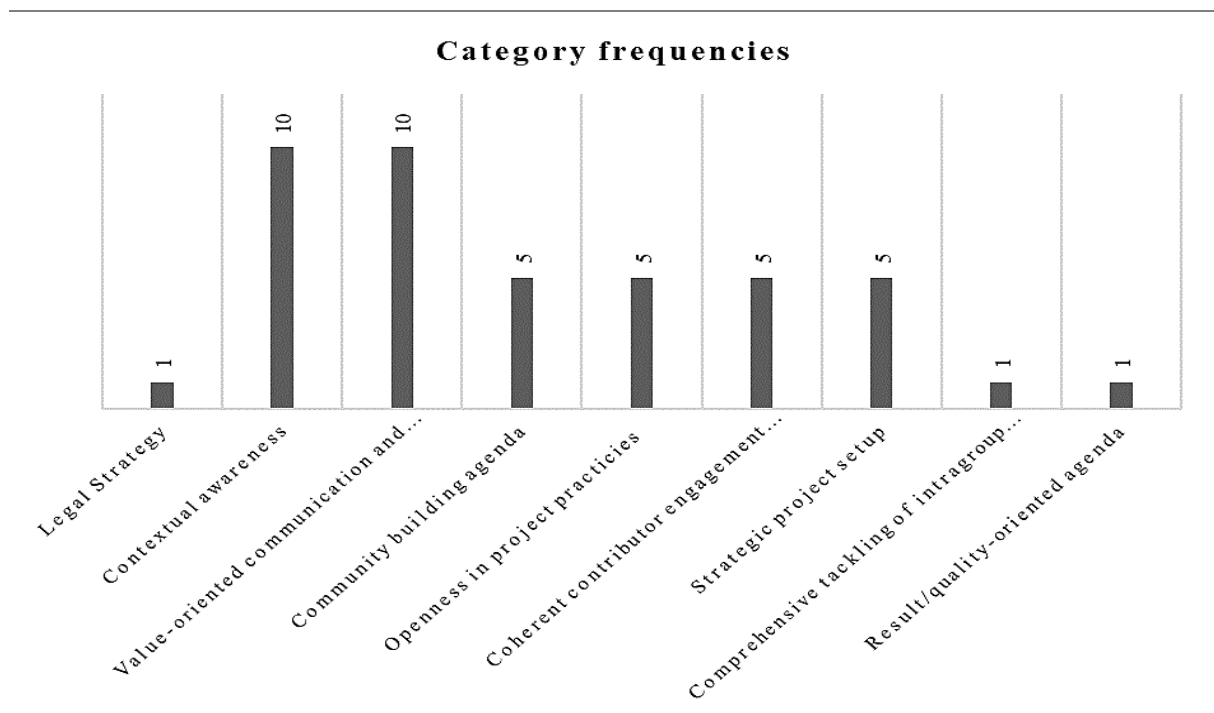
¹⁰ Hsieh and Shannon (2005) underline that depending on the type and breadth of a category, the researcher might need to identify subcategories with subsequent analysis. No such need was identified in the current study, due to the limited amount of text, which was to be analyzed. Evidence is available in the form of codes with exemplars and corresponding rules.

1.5. Research Findings

While there is a long list of articles, dedicated to the impact of social and open source innovation projects, less attention is paid to the operational aspects of achieving this success – how the underlying processes should be managed, what needs to be done in one or another area, identified as critical. Therefore, by coming with these additional insights on what is of key importance in the key importance areas, such as stakeholder engagement, I expect to deepen the understanding of the practical work that is expected to be accomplished in order to turn a social innovation initiative into success.

Because the study design and analysis did not result in coded data that can be compared meaningfully using statistical tests of difference, the use of rank order comparisons of frequency of codes was used, as recommended by Curtis et al. (2001). Based on the frequencies observed (Chart 1), it is possible to conclude that the main factors perceived to influence society's engagement in open source innovation, are matching those, related to social innovation projects: contextual awareness, value-oriented communication and collaboration, community building agenda, openness in project practices, coherent contributor engagement strategy, and strategic project setup.

Chart 1. Frequencies of categories, observed as part of the content analysis.

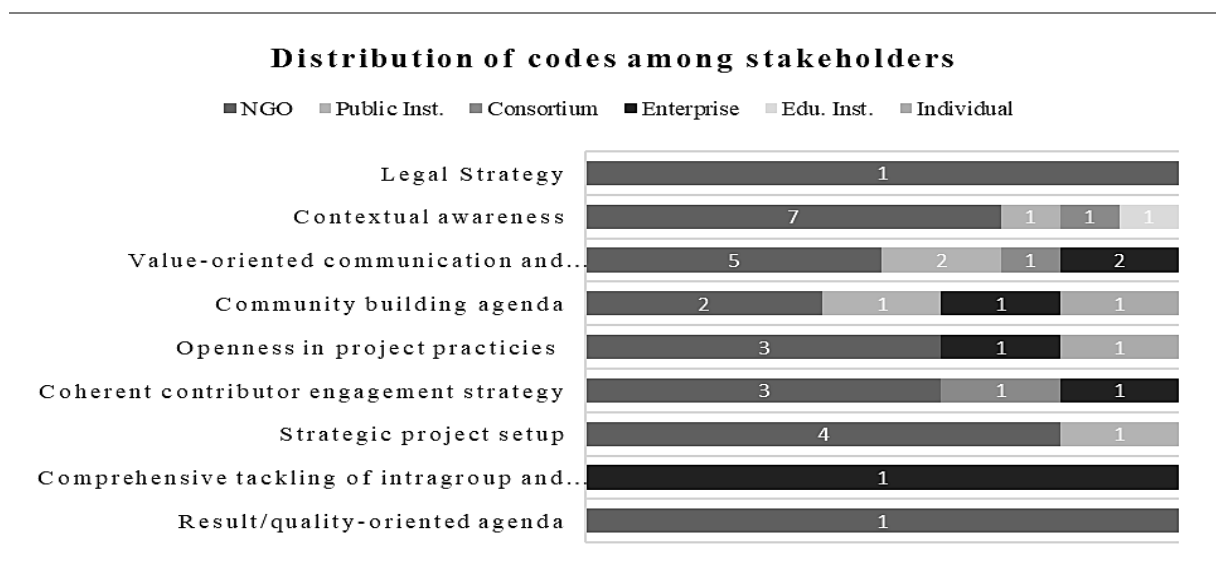


Source: Own research. (2017)

One new category emerged from the study – “Result/quality-oriented agenda“, which implies that there’s a need for the social innovation project to be perceived by society as capable of achieving its mission in order for society to get on board. This new category, as well as few of the other ones, such as “Legal strategy” and “Comprehensive tackling of conflicts”, occurred only once within the sample (22 responses were analyzed; two other interviews did not contain any response to the question of interest). This can be attributed to both the size of the sample, but also to the fact that one other question from within the questionnaire was looking at a similar matter.

If responses to that other question were to be taken into consideration, the frequency of the categories would have increased, but the scope of our study would also have been broader – from managing society’s engagement to managing social innovation in general. Despite the size limitations of the sample, data on Chart 2 shows that the categories/factors identified are considered to be of importance throughout a diverse range of stakeholder groups that are generally engaged in social innovation.

Chart 2. Code distribution, according to responders’ stakeholder group.



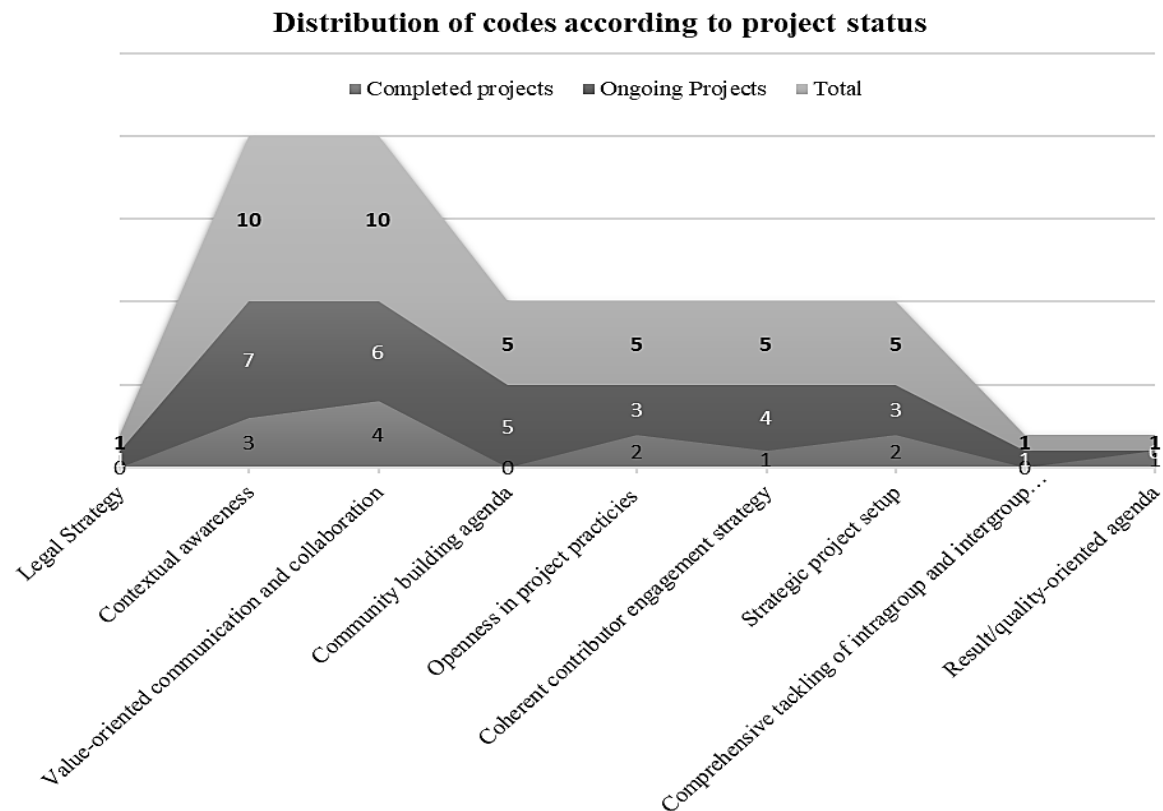
Source: Own research. (2017)

Factors such as contextual awareness, value-oriented communication and collaboration, community building agenda, openness in project practices, coherent contributor engagement strategy are detected in the responses, provided from respondents, representing at least three or more stakeholder groups (e.g. NGOs, public institutions, enterprises, etc.).

Any deeper conclusions, regarding individual respondents, and those from the enterprise, public, and educational sectors, may lack external validity and cannot be elaborated further as the majority of respondents, participating in the survey, are representatives of the NGO sector (above 60%), whereas the sample size of respondents, representing other stakeholder groups, is considered too small. It's worth noticing, however, that the only instance of “*Comprehensive tackling of intragroup and intergroup conflicts*“, detected within the responses provided, comes from a company. This is of research interest on its own, as companies are in the focus of the ‘social responsibility’ discussion and rather too often, they are accused of not understanding/embracing the concept of responsibility towards society beyond their own well-being. In this current sample, their representative is the only one to point out that issue, but on individual level.

Finally yet importantly, the distribution of codes according to projects’ status of implementation (Chart 3) confirms our initial hypothesis that the categories we use will be considered important throughout different stakeholder and project groups, and in this particular case – in both ongoing and completed projects.

Chart 3. Code distribution, according to the status of the represented projects.



Source: Own research. (2017)

Data makes it clear that from the point of view of respondents who have experience in solving social problems by completing innovative projects in diverse fields (e.g. environment, education, etc.) the most important drivers, considered to influence society's involvement in those projects, are „*Contextual awareness*” and “*Value-oriented communication and collaboration*”, which is close to the distribution of codes that is observed in the responses, provided by stakeholders¹¹, who are working on social innovation projects that are currently in an active state of implementation.

The unequal representation of the project groups in the sample does not allow us to drive further conclusions, apart from mentioning the obvious fact that in none of the responses, provided by representatives of completed projects, “Community building agenda” was detected. One may speculate that once a project is over, organizing and conducting events (and other community-building activities) is considered to be more of a ‘business as usual’-type of work.

Image 9. OS.UNIVERSITY team represented in the speakers' list on a local youth-led conference as part of the overall community outreach strategy for the project.



Source: Project archive. (Pernik, 2017)

¹¹ According to the Project Management Institute (PMI), the term project stakeholder refers to ‘an individual, group, or organization, who may affect, be affected by, or perceive itself to be affected by a decision, activity or an outcome of a project’ (PMI, 2013). This definition is embraced by the researcher when it comes to breaking the term ‘society’ down to its constituting components/stakeholders.

1.6 Research Discussion

Recommendations

Open source technologies and social innovation have emerged at a time when it is critical to adopt inclusive, creative, multi-disciplinary approaches to solving complex social and environmental problems (Huddart, 2008).

Given the fact that ‘show-how’ (demonstrating good examples) is mentioned as a key driver for the realization of social innovation projects (Oganisjana, 2016), exploitation of the similarities between open source and social innovation is to be expected. Likewise, the following of best practices by the project teams in order to achieve higher levels of engagement of society in social innovation, starting with the elements that were most commonly recognized as important:

- **Contextual awareness** – to enable stakeholders to raise their awareness of the surrounding environment and the embedded problems and opportunities, e.g. to conduct research on what other projects before starting a new initiative, the open source world relies strongly on platforms, such as “GitHub”, which supports a community where more than 22 million people learn, share, and work together to build software.
- Such platforms support project teams coalition-building efforts and help raise the levels of awareness on other key contextual elements of the projects, beyond the implementation of their core activities. Despite smaller in volume (GitHub hosts 60+ million projects), there are plenty of other collaboration platforms, similar to “IDEO”, which are partnering with changemakers to design innovative systems and tools.
- Either such open collaboration platforms should be leveraged to raise awareness on social problems and solutions, or similar solutions may be developed, tailored to specific use-cases, as long as it is done with understanding of the importance of reaching a critical mass.
- **Value-oriented communication and collaboration** – while open source projects are commonly perceived as voluntary initiatives, there are viable business models behind many of them, consisting of professional support, training, consulting, and other services that lead up to multi-billion dollar public companies, such as “RedHat”.
- While a variety of open-source compatible business approaches have gained prominence in recent years, the ‘as a service’ model behind

projects, such as “OpenStack”, is a notable profitable example that can be evangelized beyond the IT world and can win institutional and corporate stakeholders over to the side of social innovation.

- “HUB zero”¹² - an open source software platform that supports scientific discovery, learning, and collaboration, is a practical use-case for social innovation stakeholders to learn from, regarding prospects of joining commercially viable, yet socially-oriented projects, given the free opportunities for advancement it provides to dozens of research hubs across a variety of disciplines, including cancer research and biofuels, on top of which a sustainable service/support business model can be built to funnel investments in the project and generate profits for its actively involved stakeholders.

- **Research Limitations**

Because a directed approach to qualitative content analysis was implemented in the research process, more needs to be done, concerting the ‘ecological validity’ of the study – to test the capacity of research findings to make sense in their natural setting, for the people concerned (Cicourel, 1982). A useful effort in that direction would be to present the respondents with the findings and discuss their usefulness and potential to build upon them (e.g. provide training in the key areas identified as relevant to social innovation project teams).

- **Reliability & Validity**

From reliability point of view, i.e. the confidence that if data is to be gathered again, the same method would not produce different results, it should be disclosed that the researcher did not take part in the development of the main questionnaire, neither in its piloting nor broader implementation¹³, which would have been the best way to ensure that all respondents understood the questions in the same way and that corrective measures were taken where necessary, owing to loose ends in the research instrument’s design and/or its application.

At the same time, it is worth mentioning that the current study is part of a broader research effort involving a similar data collection exercise conducted in

¹² Visit: <https://hubzero.org/>.

¹³ That is apart from a single interview conducted with a participant in the research, which did not result in concerns being raised, regarding the consistency and the overall quality of the research instrument.

2016. Comparing the findings, originating from this and another qualitative content analysis, conducted around a similar question (“*In your opinion what is necessary to motivate people to become involved in the solution of social problems?*”), it is reassuring that similarities in the leading categories are being observed in both studies¹⁴. This is despite the fact that the researchers have taken different approaches to the qualitative content analysis – in the current case compared with conventional content analysis in the previous one where the coding has been done organically, i.e. regardless of any particular theory.

Regarding the validity of the research – its capacity to encapsulate the characteristics of the concepts being studied, and so properly to measure what the methods were intended to measure, as our aim was to interpret subjective meanings, it counts for little that other kinds of validity may be satisfactory, if “ecological validity” is not achieved, as mentioned above.

Image 10. The “future of work” voted as the top social priority during 2018 LSE Science Festival. OS.UNIVERSITY applies open source principles to address job market challenges.



Source: Project archive. (London, 2017)

¹⁴ The qualitative analysis from 2016 is conducted by Fashchuk, Yuliia on the “*Involvement of people in the solution of problems in the society*”. “*Awareness of social problems*“ is emerging as the top category in 2016, compared to „*Contextual awareness*“ in 2017. Other categories that are revealed in 2016 include: *communication, cooperation, social responsibility, personal gain, facing the problem, example of active participation, and others*, which are to a great extent interchangeable with the categories from the current study.

1.7 Conclusion

In view of the relevance of the theme and the importance of the issues discussed, raising the levels of stakeholder engagement in both social and open source innovation projects seems to share common success factors in today's digital age. According to the critical success factors theory, those are the few key areas where things must go right for the project to flourish. If results in these areas are not adequate, organization's efforts for the period will be less than desired, which in our case would mean low levels of engagement/disengagement of society in resolving social problems.

While the central thesis of the original study from which the initial set of categories used in the current research was derived, is that there is a specific set of success factors in the engagement of project stakeholders, applicable to open source innovation projects, and that those factors can be organized and classified in order to improve the management of this type of projects, our current research was focused on the opportunity to support and extend the application of these findings from the open source world for the purposes of social innovation projects. The latter represents the main benefit of using a directed approach to content analysis; this is why it was chosen by the researcher.

Keeping its focus on the main questions as defined in the beginning of the research, our study was able to provide support for achieving the goals of the broader research effort that it is part of. By analyzing and connecting the responses, provided by Latvian social innovation stakeholders, with a general set of factors, perceived to influence engagement levels in collaborative open source innovation projects from around the world, we confirmed that the main set of factors are not limited to any particular region, country, project or stakeholder group. Therefore, to a certain extent we confirmed the need to internationalize the scope of the research project in order to support the local stakeholders in Latvia in their social innovation efforts through cross-pollination of knowledge, which plays an important role in innovative processes.

As a first step, an initial set of best practices was presented, originating from the global open source innovation practice, but a more tailored, project-specific benchmarking approach might be of greater help when it comes to addressing the particular challenges and opportunities, embedded in the specific environment of any project.

CHAPTER 2.

INVOLVING ACADEMIA IN SOCIAL INNOVATION THROUGH PROJECTS, BASED ON “HUMAN-CENTERED DESIGN”

Originally published as part of the proceedings from the Annual Scientific Conference at Riga Technical University, this work includes an analysis of data, gathered from the workshop “Customer Development & Design Thinking Techniques”, organized by TechHub Riga in collaboration with the Investment and Development Agency of Latvia, as well as from the “Youth Speak Forum”, organized by AIESEC Latvia with the sponsorship of Ernst & Young and partners.

2.1 Research Overview

The presented academic research is devoted to the issues of involving the academic sector in effective social innovation initiatives, requiring the active engagement of the stakeholder groups, whose problems are being addressed, and resulting in new solutions that are tailor made to suit their needs. The process of shaping the Academia-driven “Open Source University” project through the application of human-centered design (HCD) tools and techniques is used as a case study within the current research article in order to demonstrate the approach of optimizing existing initiatives by generating ideas, building prototypes, and progressing ahead in a collaborative manner, eventually putting innovative solutions out in the world, together with the stakeholders they are designed for.

Image 11. Award-ceremony in recognition of an early prototype behind OS.UNIVERSITY.



Source: Project archive. (Riga, 2017)

2.2 Research Introduction

As a result of the technological and broader socioeconomic changes in the dawn of the 4th Industrial Revolution, associated with blurring the lines between the physical and the digital worlds (Schwab, 2015), individuals from all ages, dispersed all around the world (more than 3.5 billion of whom are already online) live in times of great uncertainty, but also times of great opportunities.

Social problems with broad implications to developing economies, such as addressing the brain-drain¹⁵ processes on a national level and the school-to-work transition¹⁶ in an ever-changing business environment, are complicated, context-dependent, and cross-boundary in nature (Dobele, 2015). And with the rise of the globalization-driven changes in today's technology-enabled economy (e.g. global value chains, distributed production, dispersed project teams, etc.), solving these problems effectively and efficiently by a single individual or organization, is no longer easy, hence the need for open collaboration throughout the decentralized network of stakeholders (Daskalov, 2017).

The "Open Source University" project¹⁷, aiming to help the diverse community of proactive individuals and organizations in their efforts to bypass the existing geographic, socioeconomic, and institutional barriers to high-quality education by co-creating a shared space, which enables a self-enhancing diversity of innovative knowledge transfer and learning and development (L&D) models, is a good example of open collaboration aimed at solving the existing challenges within the educational system, caused by the misalignment with the market and the human capital flight phenomena (EY, 2017), because it is based upon the main principles of open source development, among which are peer production and free access (Weber, 2015).

¹⁵ "Brain drain" is coined as a term by the Royal Society in order to describe the emigration of scientists and technologists from post-war Europe to North America. While it is right to claim that borderline regions such as the Baltics are mostly affected within the European Union nowadays (with Lithuania and Latvia reporting largest drops in population in 2015), advanced economies - from Spain to Germany (The Local, 2014) are also reported to face similar challenges as a result of the financial crises of 2008 and the sluggish economic recovery that followed.

¹⁶ According to a case study of EY (2017), school-to-work transition is characterized by high unemployment rates, high number of vacancies, employers' dissatisfaction with the skills and knowledge of graduates, thus it represents a social problem on its own.

¹⁷ More information available at www.opensourceuni.org. The project as outlined within the current chapter includes three separate systems, which are now run independently of each other in terms of development and implementation – OS.UNIVERSITY, OS.ACADEMY and GitUni. This change of strategy (compared to earlier plans) is based on the learnings from the design and prototyping phase, discussed within the following pages.

Open and experimental by design, the “Open Source Uni” project aims to promote existing piloting initiatives in the area of open learning, generate new ones, and streamline the efforts within the vast network of learners and scholars, but only if adapted to the actual needs of the stakeholders on the ground, it can achieve its mission “*to enable the creation, exploration & mastering of learning opportunities*” by helping the parties within the knowledge triangle to:

- Explore the global “ocean of information” online with more than 250 active learning platforms/solutions (identified on the stage of preliminary research within the English-speaking world only) and enable organization of meaningful group/individual educational agenda.
- Learn from each other’s experiences, resources, ideas, and build on top of them on the principles of the “sharing economy”¹⁸.
- Invent new tools for enabling academic/professional excellence and personal fulfilment in the form of collaborative educational experiences, including distributed learning pathways.

The research aims to examine the setup of the “Open Source University” project as-is and to identify areas of potential structural improvement, according to what is perceived by representatives of the local stakeholders to be of importance when it comes to solving the challenges in front of Latvia’s human capital retention and development. The specific objectives of the research are to:

- Analyze the current organization of the project, which is based on findings from the open source innovation body of knowledge, including best practices and promising pilot initiatives from around the world.
- Develop specific recommendations for improvement of project’s implementability on a local level through the application of design thinking tools and techniques on the stages of problem discovery and system development.

The main hypothesis the research advances is that the application of design thinking tools and techniques would lead to improved project design that supports the effective involvement of Academia in social innovation for the purposes of the sustainable development of Latvia.

¹⁸ The ‘sharing economy’ is a term, which in fact grew out of the open source community to refer to a broader peer-to-peer based sharing of access to goods and services.

2.3 Review of the Open Source University Project

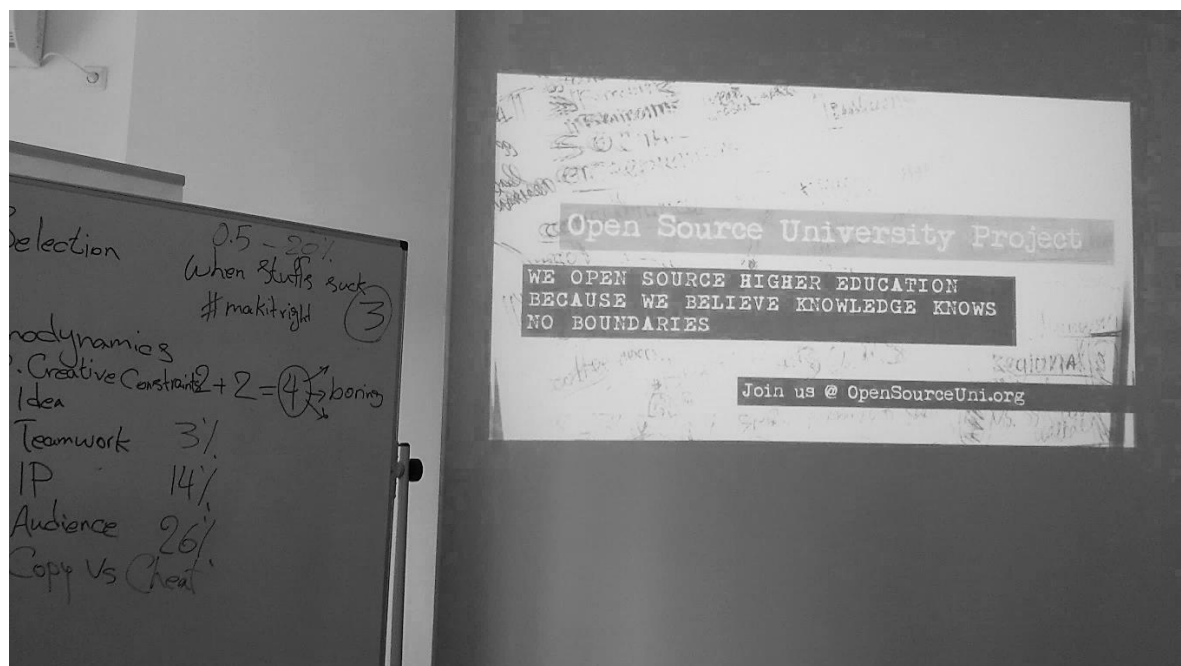
The “Open Source University” (OSUni) project intends to create a global platform for collaborative learning and research, combining the best of the open source and the academic worlds.

The name “Open Source University” reflects the application of the underlying open source technology and processes that the project leverages far beyond their intended scope of application, but very much in line with what the original definition of a University is, according to Encyclopædia Britannica (1911):

“A community of teachers and scholars”.¹⁹

The educational technology project is inspired by the success of the open source community - similar to what software programmers do over “GitHub” (among other social coding platforms), its team strives to enable Academia and the corporate world to do over the platform, i.e. to create and collaborate on distributed learning experiences, along with the learners.²⁰

Image 12. First official presentation of the project at 2015 Sofia Business School.



Source: Project archive. (Sofia, 2015)

¹⁹ Direct translation from the Latin “*Universitas magistrorum et scholarium*”.

²⁰ „GitHub for Learning” is now the main tagline for GitUni – one of the three separate systems to enable Academia transformation in line with Industry 4.0. as part of the Open Source University project. OS.UNIVERSITY as another system under the same project (on which the book primarily focuses on) has its own tagline to reflect its underlying technology – “*The World’s Learning & Development Ledger*”.

Upon project’s initiation in 2015, its core team had been formed around the Brain Workshop Institute²¹ – a Bulgarian free market think tank.

Since then, “OSUni” has engaged in different partnerships, expanding its presence around the world, including through HPE’s “Living Progress Challenge” where it has been ranked among top 10 social innovation ideas globally.

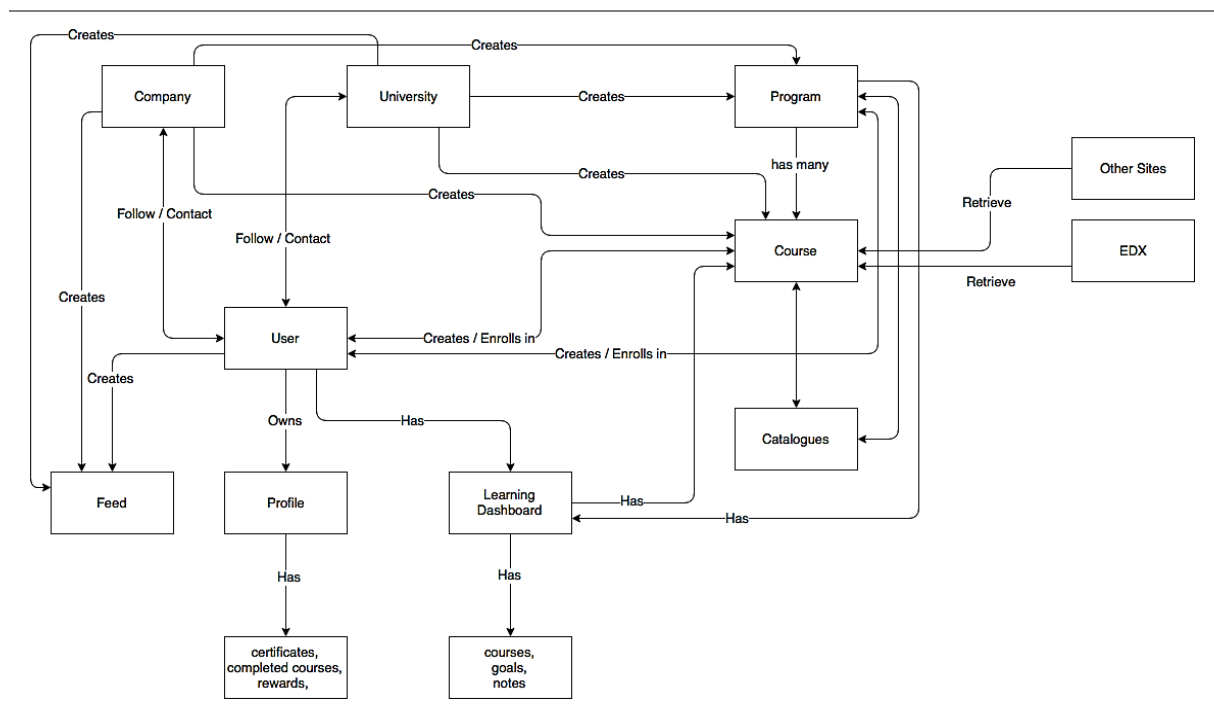
According to the project’s manifesto, modern day Academia should be:

“An open community of contributors, enabled by the borderless nature of the Internet, and not constrained by the medieval ivory-tower design of the institutions of the past”.

Unfortunately, the heritage of the first industrial revolution is today still the leading form of social organization in the world, even in areas, which are to be progressive in their nature, such as science and education.

The project aims to enable the sociotechnological transformation in the world of Academia it envisions by organizing the flow of stakeholders’ interactions in a new, more efficient and effective way, as described in Figure 3.

Figure 3. Diagram representing key stakeholder interactions within the software system.



Source: Own research. (2016)

²¹ Visit: www.brain-workshop.org/home/.

2.4 Research Methodology

To reach the aim of the current research, i.e. to draft a path for the “OSUni” project to suit the needs of Latvian stakeholders when it comes to engaging the academic sector in social innovation, the following methods were applied: analysis of existing project and research documentation and designing a set of thinking tools and techniques for problem discovery and system development, including, insights ranking, themes synthesis and group discussions.

The empirical data, which served as a basis for the research, was gathered by the researcher from the workshop “*Customer Development and Design Thinking Techniques*”, organized by TechHub Riga²² in collaboration with LIAA²³ (Investment and Development Agency of Latvia), funded by the European Regional Development Fund (ERDF), as well as from the annual “Youth Speak Forum”, organized by AIESEC Latvia in partnership with EY (Ernst & Young).

In June 2017 I took part in a workshop for discovering and understanding customers and markets, using tools of human-centered design, as according to the theory of early stage product development (where “OSUni” currently stands) the most important success factor is that the project be able to learn and adapt accordingly as much as possible, in as cost-effective a manner as possible (Roznoshchik, 2017).

The workshop “*Customer Development and Design Thinking Techniques*” covered areas from low-cost prototyping to research methods and tools for translating discovered insights into a form that can be used to advance the development of a product. It included theory, case studies and practical tasks for early-stage startups and aspiring entrepreneurs on how to:

- Perform customer and market research;
- Discover product opportunities;
- Prototype quickly and cheaply;
- Communicate & understand key points of the project idea;
- Develop new product ideas for testing.

²² TechHub Riga is one of Latvia’s biggest co-working spaces and a regular meeting place for the startup and investor communities in the capital of Riga. See more at <https://riga.techhub.com/>.

²³ Visit: www.liaa.gov.lv/en.

The workshop, delivered in English, was led by Rostislav Roznoshchik²⁴, a practicing design researcher, experienced in applying the design research process in a range of industries, including healthcare, education, product and marketing.

While it addressed the topic of interest within the current research, the workshop was suitable not only for ed. tech. / social innovation start-ups, but for a broader group of local entrepreneurs, freelancers, even students, who are looking to launch a business or are working on a business idea. That is because the tools and techniques that were leveraged are applicable to a broad range of situations – from active projects to fresh new ideas, developed throughout the workshop itself, similar to a ‘design sprint’ or a ‘hackathon’ setting. Again in 2017 the researcher attended the second of the events outlined in the current research, which was conducted in a similar manner, but was limited to students and young researchers, given the narrower scope of work of its organizers from AIESEC Latvia.

- **Problem Discovery with Human-Centered Design**

The phase of problem discovery, as described by IDEO (2016) is one of the main things that separates the design thinking approach from the conventional business/project practice – the strong research and observation focus aims to achieve better understanding of the existing situation and to generate inspiration and insights that can then be synthesized and serve as a solid base for design and implementation of meaningful solutions. Without that phase, it is difficult for social innovation stakeholders to address the underlying issues behind otherwise broadly defined questions to answer, such as the ones brought forward at the workshop:

- Why do you think young people are leaving Latvia?
- How might we make Riga a place young people want to live in?

Through interviews, discussions, brainstorming, among other research techniques, enough analytic inputs are being generated so that coding can occur as a next step (synthesis/grouping of similar ideas and themes) from which insights/statements are being formed, and eventually “*How might we*” questions

²⁴ Rostislav Roznoshchik has worked with startups and with established companies and is currently co-founder of a pre-seed startup himself.

are being formulated around these specific insights and not around the broadly defined question at the beginning of the process (visualization on Image 16).

Image 13. The process of turning observations and findings into insights and opportunities.



Source: Project archive. (Riga, 2017)

Methodologically wise, what is described is the first part of the process through which a project such as “OSUni” passes in order to be assessed if the problems it addresses are the ones that are relevant to the surrounding environment, i.e. if it represents a suitable solution for the Academia to leverage in order to bring social change. Building an innovative global solution, promising to “*revolutionize the way we study and grow*”, emphasizing on the fulfilment of “*one’s personal potential over the environmental limitations*”, requires the active engagement of like-minded experts from around the globe not only for the project to spark the global movement/critical mass that is needed, but also for that movement to be able to tackle country and even region-specific situations.

▪ **System Development with Human-Centered Design**

The stage of formulation of “How might we” questions is associated with the generation of a number of ideas (ideation), which is about diverging (creating options), applying techniques such as “The power of ten”²⁵, before another round of converging (making choices) upon which the ‘*prototype-learn-prototype*

²⁵ “The Power of Ten” is a term, originating from the film of the same name by Charles and Ray Eames – a movie about one of the most important principles in design—reframing the question, hence removing the constraints of ideas. See more at: www.designthinking.ideo.com/?p=1043.

again' model rests, referred to as *'learn-understand-realize'* by Roznoshchik (visualized on image 2). When it comes to applying the concept for the purposes of the "Open Source University" project, the research looks at the outcomes of the design-thinking activities throughout the "Youth Speak Forum" event, focused on answering the question, raised by EY consultants: "*How might we improve the qualification of young graduates to increase their employability?*" in line with the themes and insights from the "TechHub"/LIAA workshop, though independent from each another.

Image 14. Group discussion as part of the solution/system prototyping process.



Source: Project archive. (Riga, 2017)

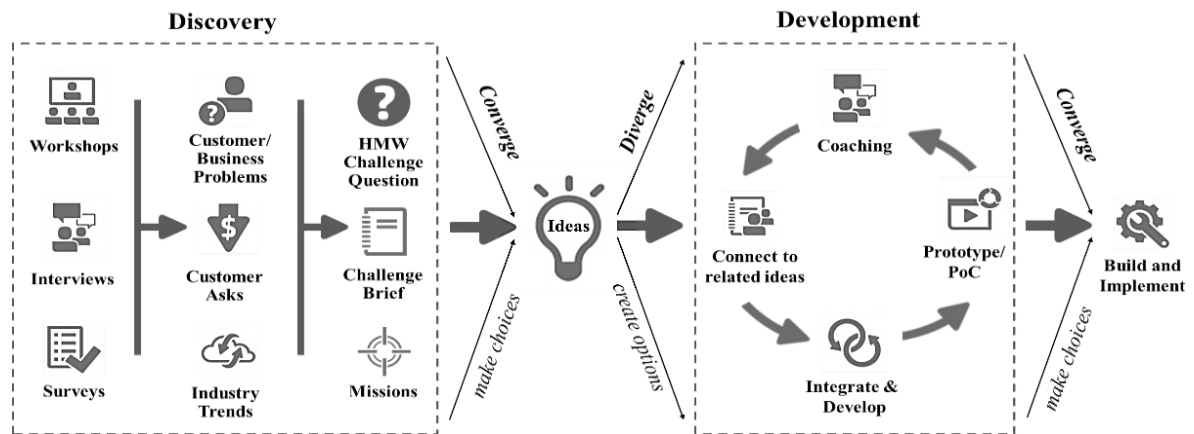
The application of human-centered design methods on the stage of system development of "OSUni", i.e. during the process of defining, designing, testing, and implementing the project from an information system perspective (FCA, 2007), is critical for the success of the undertaking on a local level, because both students, enrolled in Latvian universities, and life-long learners, have many ways to leverage the "OSUni" platform and give back to the community, but only some of these use-cases would be addressing the most urgent needs from socioeconomic perspective:

- Finding open educational opportunities internationally (both online opportunities such as 'MOOCs' and standard on-campus experiences), adapt to one's own academic and professional development needs.
- Sharing pathways to excellence and influencing others to curate their own paths or build on top of the ones that are already highlighted.
- Keeping track of progress and accomplishments achieved.

2.5 Research Findings

The findings from the research follow the logic of implementation of the ideation and idea development flow, associated with the implementation of human-centered design, as described thus far and as visualized on the Figure 4.

Figure 4. End-to-end design workflow from problem discovery to system development.



Source: Adapted from Hewlett Packard Enterprise corporate practice. (2016)

Based on the analysis of the stakeholder inputs, gathered over the events of research interest, on the stage of problem discovery it became clear that the value proposition of the Academia-driven “Open Source University” project (Table 2) is suited for the purpose of tackling some of Latvia’s most urgent human capital retention and development challenges, as outlined herein, in particular when it comes to certain aspects of the educational process, considered to be problematic – level of internationalization and the relations between Academia, learners, and businesses²⁶.

Table 2. Project value proposition, adapted to key stakeholder groups.

Individual	Organizational	Governmental
The “Open Source Uni” platform would enable students to find, organize and get use of educational content	Creating and merging online, offline, academic, enterprise, and other resources of quality into hybrid learning	While academic, corporate, and public sectors are to be equal contributors when it comes to building

²⁶ Among the other topics defined as having to do with young educated people leaving/staying in Latvia, institutional environment (e.g. governmental policies), career concerns, and personal preferences (e.g. weather preferences) were outlined.

<p>from Latvia, but also from around the globe without necessarily needing to relocate or to adapt to certain institutional limitations (e.g. enrollment processes / tuition fees, etc.).</p>	<p>experiences, requires for business to participate in chartering the paths and adapting them to current or perspective employees, customer groups, specific communities they address.</p>	<p>meaningful paths for academic and professional development, institutions and their policies on regional and national level are the ones to benefit strategically from the implemented solutions.</p>
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Source: Own research. (2017)

As outlined in the “OSUni” project white paper, its main promise is that “*you can grow and help others grow by getting involved into collaborative learning projects, enabled through the platform*”:

- Launching a project by creating a dedicated repository on the collaboration platform and running a new open source learning project or forking an existing resource, hosted on the platform (or elsewhere).
- Exploring the official learning catalog for suitable projects to get involved in as an active learner or a member of the respective teams.

The feasibility review of the service offerings on top of the open platform, which are focused around the purposeful management of the knowledge flows across organizational boundaries through application of innovation management and community engagement tools and techniques, led to the conclusion that strategic changes need to be implemented into the model of operations for the online platform to become an effective, thus attractive tool for Academia to leverage for the purposes of social innovation in the Latvia.

Given that the core of the open source initiatives depends on the participation of different stakeholders in the process of voluntary sharing and cooperation, efficient management of their engagement becomes a key condition, leading to the achievement of project objectives (Daskalov, 2017). Therefore, not all can be left in the hands of the users themselves, which is how the project team originally envisioned the system to work.

For the purposes of opening-up educational courses and programs, “OSUni” applies processes and instruments, proven to be highly effective in the field of software engineering (e.g. “Git” - world’s most popular distributed version control system /VCS/). Some users with non-technical backgrounds might consider these to be challenging at first, hence that need for a support layer on top. However, as the economy transforms, the need to master technologies and tools beyond your ‘comfort zone’ will grow, hence learning Git’s basics might not be a bad idea.

Image 15. Statistics on 2015-2020 skills shift in regards to the economic transformation.



A full spectrum of consultancy services needs to be provided to organizations (universities, companies, non-profits), which are interested in leveraging the platform for professional academic use or with specific custom use-cases in mind (e.g. running organization-wide initiatives and large-scale campaigns). From system development perspective, considering that “OSUni” primary goal is to connect the dots in an ever more dispersed L&D environment, some less innovative, but user-critical functionality was prioritized with the broader picture in mind.²⁷ The personal portfolio module was found to be a key ‘ingredient’ within the standard platform functionality, because it provides the much-needed visibility over individual accomplishments and achievements. Blockchain as another open source technology was the obvious choice to innovate around it.

²⁷ Dozens of platforms from around the world offer MOOCs. “OSUni” promises not to replicate their closed model of in-house content production. Instead, it offers a guided pathway – from planning and co-creation of learning content (though a distributed version control system), to the phase of the actual delivery (through a LMS, such as Open EdX), and the validation of learning and skills. This shared experience allows for higher engagement levels.

2.6 Conclusion

As the paradigm of open innovation goes, organizations should leverage external ideas, along with internal ones, in order to advance their products, services and operations (Chesbrough, 2003). “Open Source Uni” – a project that seeks to answer whether it is possible to replicate the success of the open source approach of software engineering in other fields of science for the benefit of society at large, represents an open platform, suited for that purpose, especially when it comes to research and education, given the fact that it enables the distributed innovation process. The current research highlighted that “OSUni” is not only a vehicle for open innovation in the social sector, but it can also benefit from the community engagement and the invaluable insights that are being generated.

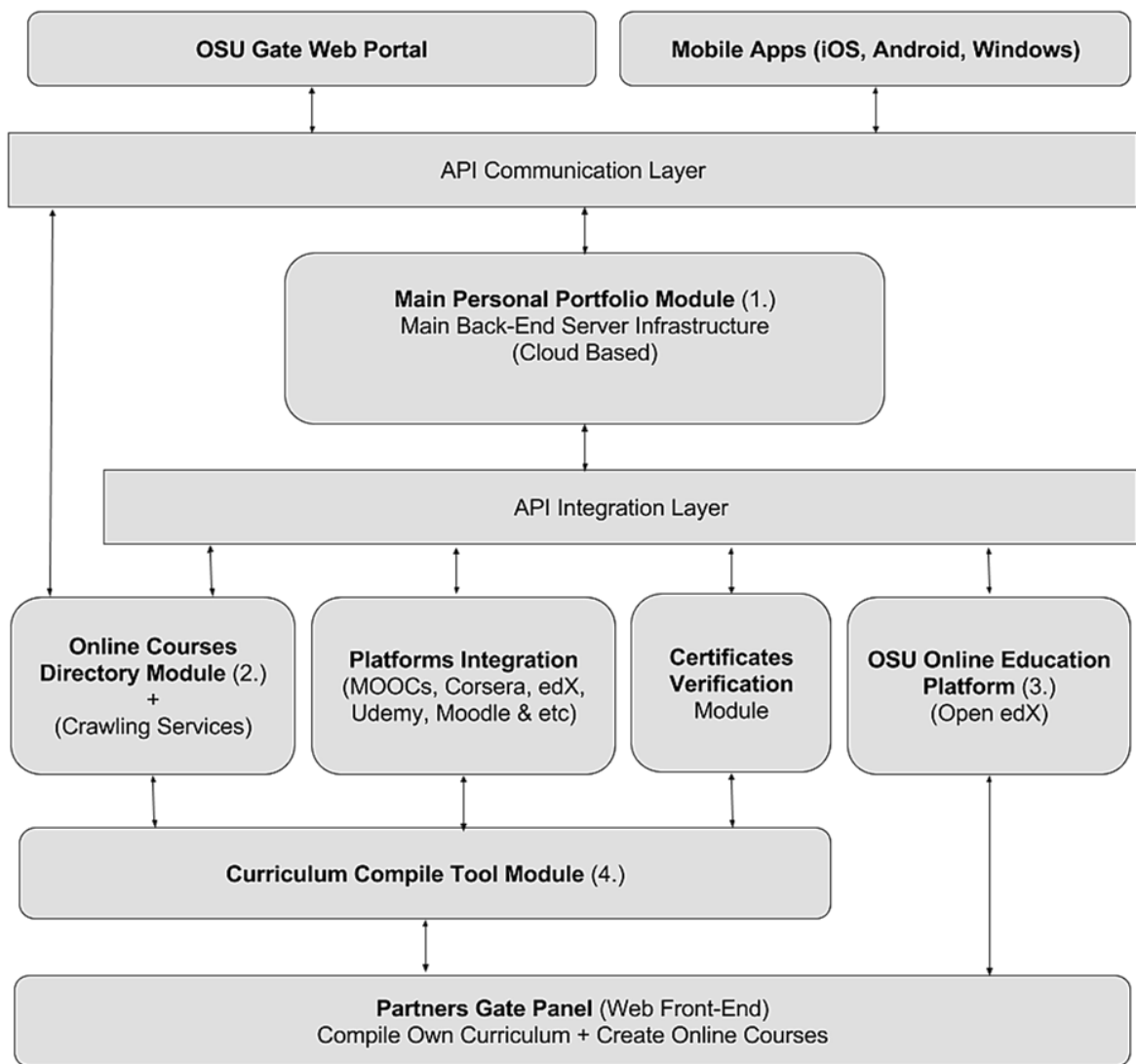
The main conclusions of the article are related to the fact that in order for the “Open Source University” to become a leading ed. tech. project in innovating academic studies, thus influence social change, it needs to roll-out the technological opportunities for mutually benefiting partnerships of social and commercial value it offers (figure 5), in a way that meets the needs of the local stakeholders. In the case of Latvia the research found these to be articulated in a general agreement, based on data from two independent social innovation forums, leveraging the tools and techniques of design thinking.

The ideas of leveraging distributed version control system (VCS) and distributed ledger technology (DLT) were among the main outcomes of the design thinking process around the project (this does not appear in the original blueprint). Through “Git”, one will be able to create personal/organizational project repositories, serving as a base to open-source learning programs and would be able to benefit from the contributions of experts and fellow colleagues from around the world. Through blockchain – to validate and verify the accomplishments around these.

For a course or program to be open by design, they need not only technological enablement, but also an active collaboration throughout the network of stakeholders – right from its initiation and all the way to its delivery. A simple solution to open source a course syllabus/ program curriculum, however, gives learners a starting point for them to achieve the flexibility they (as well as the market) seek, while the increased levels of engagement and the useful feedback in return makes it a real ‘win-win’ opportunity.

Another use case, brought up during the workshops, is related to leveraging “Git” for applying relevant research methods within the educational process, such as case studies that businesses bring forward, lecturers integrate within the academic process and students collaborate on to find solutions to real-life business situations than can then become part of their e-portfolios.

Figure 5. Original blueprint of the “Open Source Uni” technological implementation.



Source: Own research. (2016)

The topicality of the study is related to the upcoming launch of the beta version of the platform at the end of 2017. The bold vision for “OSUni” unveils plenty of opportunities for mutually benefiting partnerships of commercial, but most importantly – of social value, that have the potential to address successfully what the consultants of “EY” describe as ‘*school-to-work-transition*’ challenges and what students and entrepreneurs see as a reason for young people to run away.

Opening up the process of developing educational courses and programs in Latvia (and beyond) will not only positively influence their quality and implementability, but will also increase the visibility and recognition of the academic sector in the country as an innovator of a global scale, thus support its internationalization.

It is an opportunity for all stakeholders to advance forward – socially and technologically, and the more use cases the research community brings forward to make this institutional transition happen, the bigger the leap will be.

While the design insights on the “OSUni” project, generated collaboratively throughout a diverse community of stakeholders, support the initial hypothesis that was brought forward, the in-depth development of the right technologic solution is still a work in progress, kept behind ‘closed doors’ until the launch of the open-sourced beta version.

The development process itself represents an interesting subject for further research, especially in the light of the application of the decentralized blockchain technology²⁸, which due to its disruptive pee-to-peer model is becoming an ever more popular subject far beyond the world of fintech.

Image 16. Interview on Bloomberg TV – Bulgaria, disseminating the research progress.



Source: Project archive. (Sofia, 2017)

²⁸ Leveraging the blockchain will satisfy the need, identified within the scope of the current research, for a vendor-neutral verification that is to be provided on-demand for selected distributed learning pathways, allowing learners to get the recognition they deserve upon the successful completion of certain educational milestones, behind which there would be numerous university credits, digital badges, certificates, and other forms to acknowledge achievements and excellence.

CHAPTER 3.

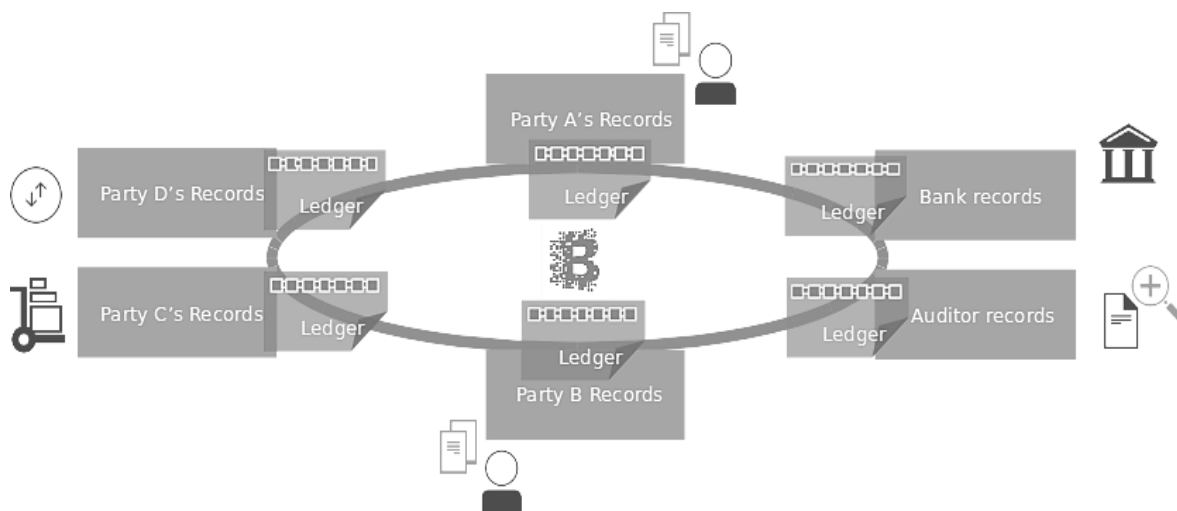
APPLYING FINTECH INNOVATION IN THE WORLD OF EDUCATION – THE PILOT CASE OF OS.UNIVERSITY

Originally presented by the author under the title of “Application of cryptocurrency innovation beyond the financial world. The case of the blockchain as a medium for organization of Academia-business cooperation” and published as part of the proceedings from the 3rd annual monetary and economics scientific conference at UNWE’s Center for Monetary Research (Sofia) with special focus on monetary systems, policies, and innovations.

3.1 Research Overview

The true potential of cryptocurrencies and DLT (distributed ledger technology) in general is still not fully revealed, expanding far beyond the financial sector with promising blockchain-based projects being presented in different fields of economy, ranging from transportation to creative industries, even public governance (Ovenden, 2016).

Figure 6. IBM view on how a coordinated transfer of data between different corporate stakeholders can occur over the blockchain in different fields of business, manufacturing, etc.



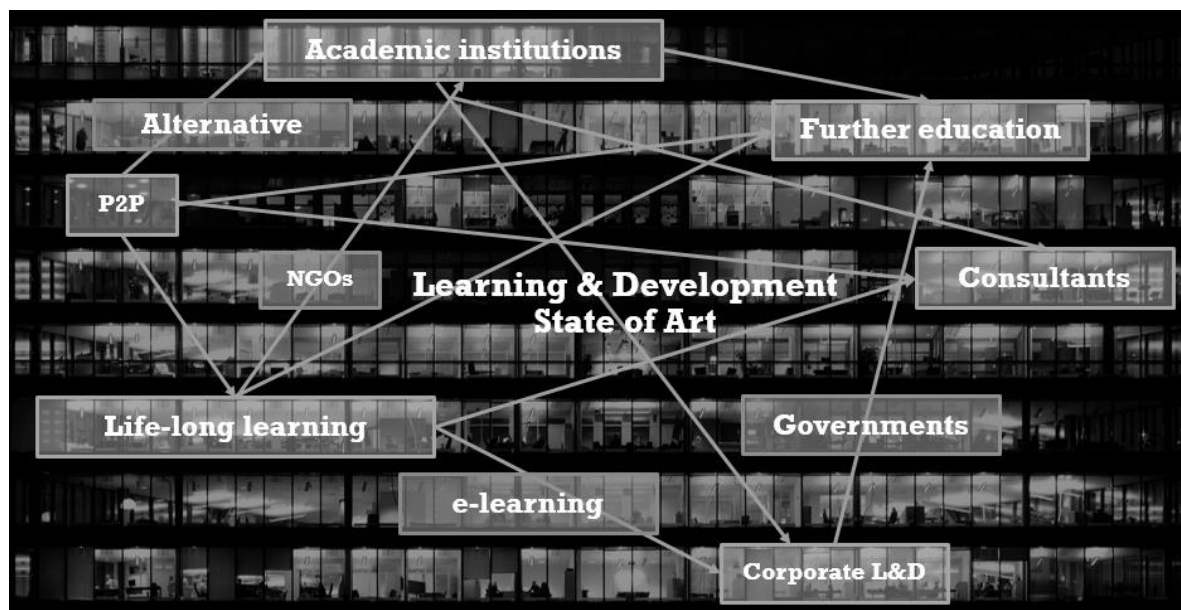
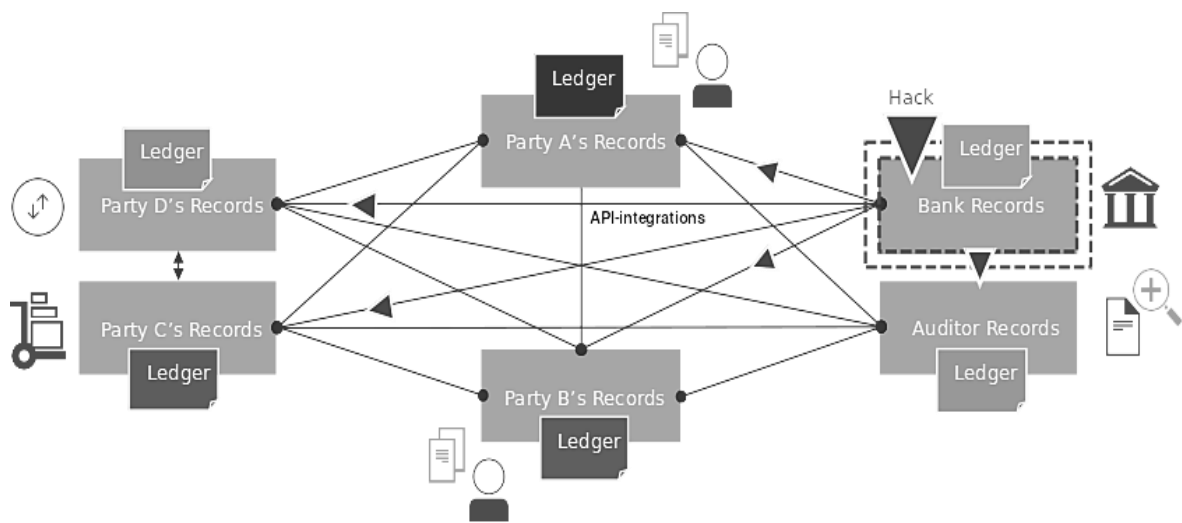
Source: IBM Research. (2017)

Consistency, efficiency, security and scalability of data for transactions throughout the chain – these are among the advantages of leveraging the blockchain as a distributed immutable database. Beyond understanding in general how DLT or simply put - blockchain works, it is important to understand the types of problems facing institutions that it appear to be good at solving:

- Eliminating paperwork;
- Updating/re-engineering (“extinguishing antiquated”) processes;
- Creating transparency.

It just happens so that the above-mentioned are all urgent needs, present in the educational industry among others. Just compare the two schemes below. The first is from 2017 IBM research on the application of blockchain for corporate needs. It shows the difficulty of information & asset exchange in business networks, e.g. in supply chain management.

Figure 7. IBM vs. OS.UNIVERSITY use-cases, displaying the information coordination difficulties when data/records need to be passed beyond institutional borders seamlessly.

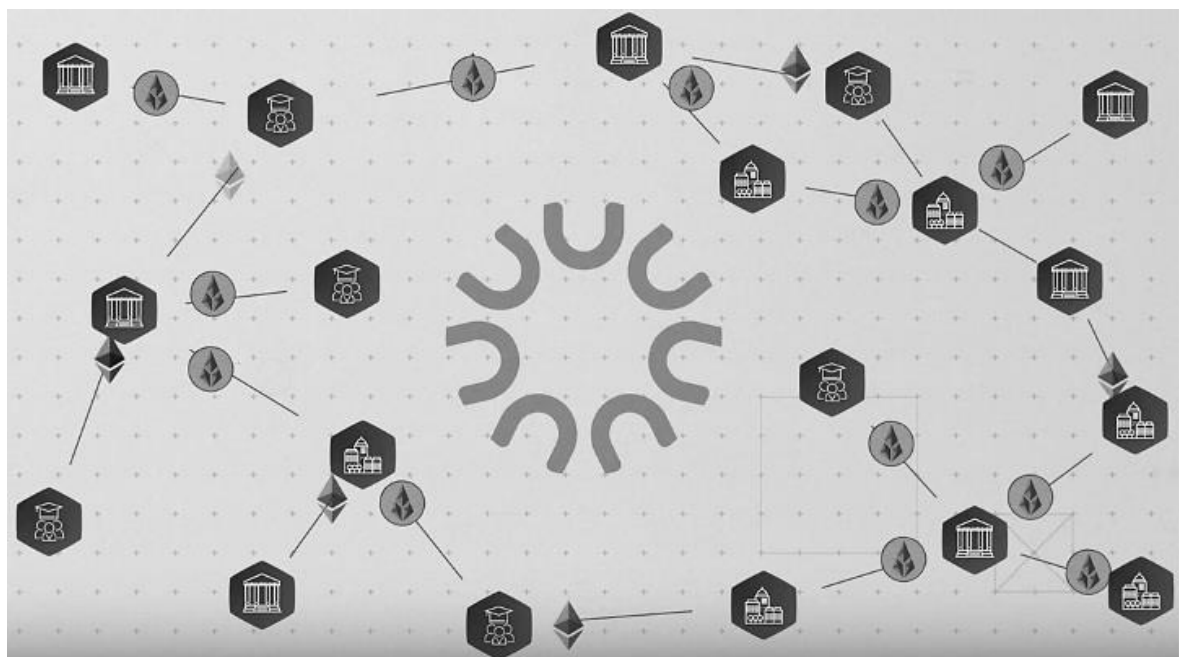


Source: Project archive. (2017)

The second diagram represents the struggle to pass, organize, validate and verify information or organize learning and development in meaningful pathways beyond a particular agent. Metaphorically speaking, the process requires knocking on a lot of doors, many of which lead to restricted zones; or going up and down floors, struggling to navigate as if you were in a huge corporate building with no knowledge of its layout. Within the current research article, the “Open Source University” (OS.UNIVERSITY / OSUni) project is closely reviewed, serving as a case study on leveraging this technology for the purposes of enabling University-Business cooperation and much more.

Within the OS.UNIVERSITY ecosystem, the innovative “EDU” token is intended to facilitate these above-mentioned connections throughout the distributed network of universities, learners, and businesses, thus enable learning pathways of new generation, accessible and operated globally - from enrollment to registering the final accomplishments over the blockchain.

Image 17. Visualization of the circulation of data (and tokens) within the distributed network.



Source: Project archive. (2017)

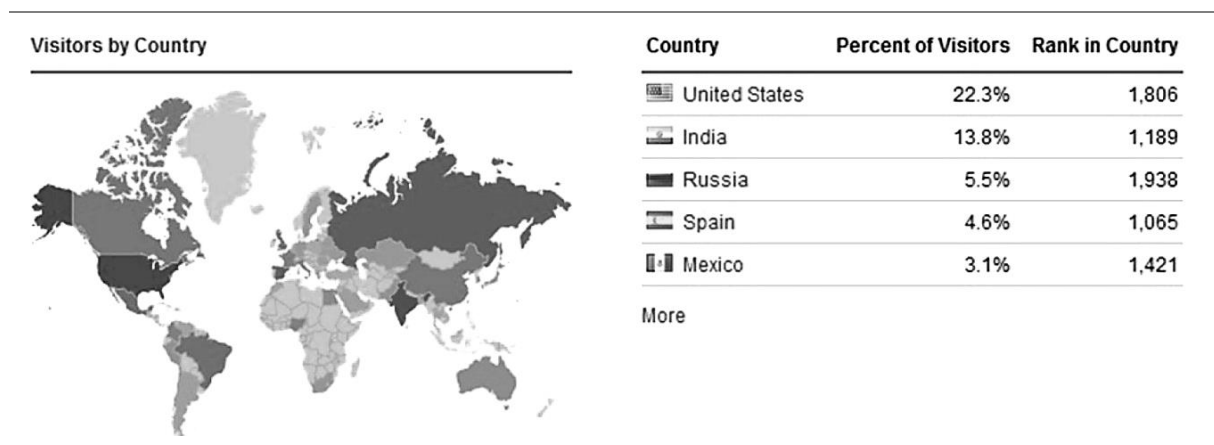
The aim of research is to achieve better understanding about the application of the blockchain technology within the academic sector for the benefit of the partners within the knowledge triangle - educators, researchers, businesses. The objectives are to analyze the organizational, as well as the technological aspects of the piloting project, in order to raise awareness among the stakeholders.

3.2 Research Introduction

Billions living in turbulent times of social and economic unease, related to the transformation of the global economy (WEF, 2016), are still waiting for a scalable solution to revolutionize the way they learn, advance, and succeed at the dawn of the 4th Industrial Revolution. Despite the technological progress, millions are being left behind, due to flaws in the classic system of education. Not because there are no suitable development opportunities for them in the digital era (UK Government, 2016), but because of the lack of a proactive, pioneering effort, which is successful enough to power a sociotechnical solution that brings these dispersed opportunities closer to end users (learners, educators, businesses, governments), allowing adaptation and adjustment, according to a diverse set of personal needs, growth aspirations, social lifestyles, economic and environmental constrains. A solution that never the less, brings the stakeholders closer together, given the existing gaps in the information coordination relationships that are needed to match skills to jobs (EY, 2017).

Only now, with the rise of the blockchain technology, such a complex solution is starting to look implementable from system perspective, due to the decentralized approach that enables one such educational protocol to connect strategically the expanding knowledge production and knowledge consumption systems. „Coursera“, is an example of this rapid expansion (fig. 1), having been founded only 5 years ago, has more than 23 million learners (students and life-long learners), coming from 190+ countries, signed up for its learning experiences that include 1,700+ online courses, delivered across all continents.

Chart 4. Distribution of registered users of popular MOOCs on Coursera.



Source: Alexa.com. (2014)

The numbers below (actual as of 2016) highlight the success of some of the other leading content providers in an extremely saturated market with more than 150 existing platform solutions, operating on the global stage²⁹ without mentioning the 26,000 higher education institutions on top of which they are built. Such numbers speak for the great need to support and advance the expansion of the sector for the good of society in general, but also to the challenges that this fragmentation within the broader „ocean of information“ leads with itself from organizational, verification and validation perspectives:

- Open EdX is an open source platform that powers thousands of online courses with more than 10,000,000 registered users.
- Udacity was launched, based on a successful online pilot in Stanford that quickly attracted 160,000 students from more than 190 countries.
- Udemy has over 7 million learners, more than 30,000 courses in 80+ languages, and more than 16,000 registered instructors/tutors.

The case study through which the article addresses the challenges that the system is facing, i.e. the OS.UNIVERSITY project, views the future of the Academia close to what it was initially intended to be – a community. Such an approach would allow stakeholders to join forces in their common effort to achieve and preserve excellence, given the ever more dispersed pool of resources and the problems surrounding the established institutions that once operated without competition external to the traditional academic system.

Today, despite living in the information age, on-campus university programs of quality remain far from affordable in many developing and developed economies, because of high tuition costs and overwhelming debt (Daskalov, 2017), leading to the point that experts start to look at the higher educational market as the next big bubble to go bust (Capital, 2016). While in the same time, those same on-campus programs, either public or private, are starting to lose relevance for a growing number of learners, especially in attractive fields, such as IT, in which young professionals are entering the workforce, often before formally finishing their studies, having to choose between aspiring careers and fulfilment of their academic degrees (Shapiro, 2014).

²⁹ Numbers include end-user oriented platforms (not b2b or internal corporate solutions) that are addressing predominantly English-speakers and do not include a wide variety of platforms on national level. Numbers are based on a preliminary research, conducted by the author.

3.3 Theoretical and Practical Foundations for the Case Study

One of United Nations' Sustainable Development Goals (SDGs) is to ensure inclusive and quality education for all and promote lifelong learning. The crypto-revolution that is happening now has the potential to achieve that goal by making education more affordable (by lowering transactional costs) and simpler to organize and deliver (OEB Insights, 2016). According to the Open Source University project, decentralization and smart-contracts are the new solutions for people to be educated and qualified through, in a situation of constantly changing business demands. The project promises to bring the educational process to „*its next level*“ where businesses, students, and universities find „*common ground, pushing the economy forward in a unison*“.

Having in mind that “Universitas” stands for “the whole, the universe, the world” OS.UNIVERSITY intention is simple – to re-establish this classical community of teachers and scholars in a way, which it is fit for its purpose of the Digital era, given that the technological and learning capabilities, our means and opportunities to connect, are far beyond those, according to which the 11th century learning community was designed castled and siloed. In contrast, OS.UNIVERSITY is designed to be a distributed education and certification platform, operating on the public Ethereum blockchain.³⁰

The current research focuses on understating better its underlying promise - “*to enable businesses, learners and universities to collaborate in a transparent manner with the help of 3 main networks*”. More precisely, the article looks into outlining and analyzing the processes of:

- **Enabling the integration of massive open online courses (MOOCs)** and other high-quality learning opportunities, distributed over a number of online platforms and providers, leveraging smart contracts;
- **Defining distributed educational programs** – “open source degrees”, representing the demands of businesses, which publish them on the Ethereum blockchain, thus allowing the learners to complete the learning pathways and receive formal recognition of their achievements.

³⁰ Ethereum is a platform for decentralised applications, built on top of a blockchain mechanism, which can be used for public data storage and computation. It acts as an immutable public ledger, which provides strong cryptographic guarantees for data integrity. One definitive feature of the Ethereum platform is the ability to execute Turing-complete Smart Contracts. A Smart Contract is a program on the blockchain.

While the topics of open collaboration and open innovation are not new to the academic community (Agranoff; McGuire, 2003), with many best practices in the public and private sectors when it comes to engaging Academia in cooperation with other entities within the knowledge triangle (OECD, 2016), conducting this collaboration through the blockchain is an entirely new approach, already praised by ones (EdTech, 2017) and rejected by others (HackEducation, 2016).

Despite the differences in the views on the subject, there are currently no solutions, comparable to the value proposition behind the Open Source University platform setup, despite both „Sony“ on the corporate side (Sony, 2017) and the „Open University“ on the academic (Open Blockchain, 2017) are working on early-stage experimental designs³¹. Therefore the need to study the pilot in details and the eco-system that surrounds it.

When it comes to the eco-system, the preliminary research reviewed 50+ platforms, providers of open educational content that are established online brands – universities, networks of universities, etc., but the main idea behind such platforms is to provide opportunities for educational content creators to attract learners for their course offerings. OS.UNIVERSITY value proposition, however, is different. It builds upon this base, providing the opportunity to aggregate different learning opportunities within the blockchain³², enabling stakeholders to organize them into meaningful cross-institutional programs, so that there is an end-to-end learning experience that can be pursued, achieved, and recognized for its excellence.

Last but not least, there are useful online aggregators, such as “Course Talk”, “Class Central”, „Course Buffet“, which do help learners navigate within the dispersed content environment, and there are projects that go on step further, such as „Udacity“, which organizes its courses into bigger and broader offerings - “nano-degrees”. But none of them empowers users to organize their learning and development journeys in a decentralized manner, enrolling in tailor-made programmes, endorsed and recognized around the world, either as fully-fledged alternatives or as useful extensions to traditional closed-source / in-house education.

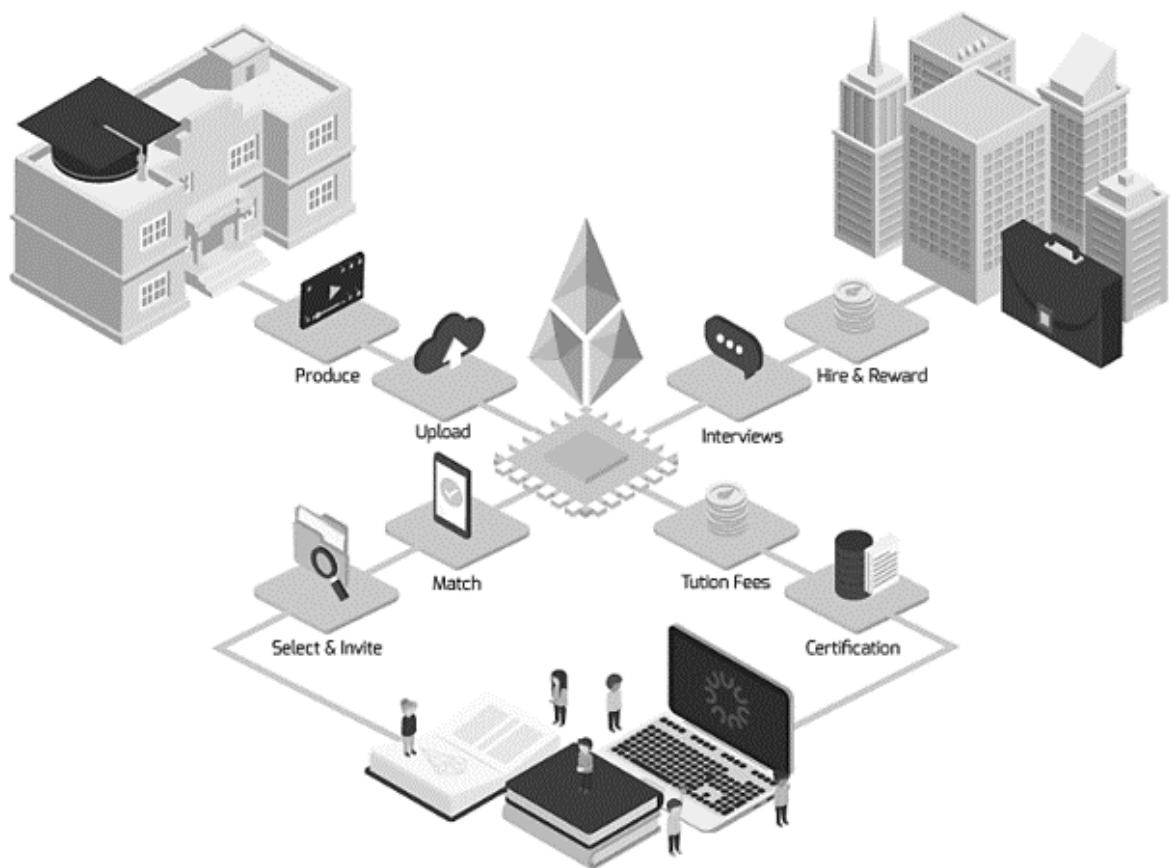
³¹ Visit: www.blockchain.open.ac.uk.

³² A blockchain is a perfect place to store value, identities, agreements, property rights, credentials, etc. It serves these purposes when it comes to being applied in education, i.e. it is not a substitute to LMS, a content repository.

3.4 Research Methodology

To research the mechanisms of organization of an educational project that enables aggregation and delivery of learning experiences, coming from providers from all over the world, in a variety of different languages and platforms, the best way would be to analyze the stakeholder relations and interactions at every step of the process of organization of the learning opportunities, spread across the network, and the engagement of learners, universities, and businesses as described in figure 8.

Figure 8. Model of organization of the relations among the distributed network of stakeholders within the OS.UNI DApp eco-system – from content production to hiring.



Source: OS.UNIVERSITY White Paper

As part of our approach to the research, we are going to review the partnerships within the network of stakeholders the same way the OS.UNIVERSITY project is approaching learners, educators, and companies in its quest to gain traction - at strategic, tactical, and operational levels of engagement.

Some of the potential partners that the OS.UNIVERSITY team outlines within project's white paper (on the ed.tech vertical) include „Coursera“, „EdX“, „Udemy“, „Future Learn“, „Open 2 Study“ and others.

As business partners, OS.UNIVERSITY intends to approach “Fortune” technological companies, working closely with their HR/L&D departments to flawlessly adopt the technology, while in order to build traction among students, OS.UNIVERSITY will approach international, national, and local-level technology-oriented / representative student bodies, including: “ESU” (European Students Union), “ESTIEM” (European Students of Industrial Engineering & Management), “BEST” (Board of European Students of Technology), and others.

While the article looks at what is planned, it also reviews the progress achieved thus far in order to extract valuable insights on where the project is in terms of actual execution on the promised innovation. As an example, it relies on observations from „HackConf 2017“ — one of the biggest events in the IT world, bringing learners, educators, and businesses together. During the conference, OS.UNIVERSITY project team organized an “Ethereum Smart Contracts” workshop, preparing a fully featured smart contract³³, together with the learners.

Image 18. Workshop on smart contracts, based on the principles of OSUni - open learning, direct interaction and sharing within a broader network. Conducted at Sofia Tech. Park.



Source: Project archive. (Sofia, 2017)

³³ The features of smart contracts, i.e. programs on the blockchain, are the following: - business logic that can be assigned to a transaction on the blockchain; - acts as a ‘notary’ of blockchain transactions; - holds conditions under which specific actions can/must be performed; - can’t be modified without predefined permissions.

The workshop that is subject of review was organized on September 29th at Sofia Tech Park. Jordan Jambazov and Dobromir Kovachev from OS.UNIVERSITY team opened the event with presentation on the blockchain, sharing various details, related to the technology and its implementation that are mentioned within the research – foundations of trust in a decentralized environment, existing cryptocurrencies, distributed systems, and the Ethereum platform as such.

The practical part of the workshop included an actual Ethereum smart contract that participants initiated by setting up the so called „Truffle Framework“ on their machines, and then scaffolding their project — „Ethereum Pet Shop“. At the end of the workshop, important feedback from the learners was generated in regards to the OSUni project itself.

Similar workshops were also organized and conducted on other occasions (see the bellow image) to enhance the overall publicity and community outreach efforts of the team and its partners from the corporate and academic world.

Image 19. Workshop on smart contracts, conducted at a leading software education provider.



Source: Project archive. (Sofia 2017)

3.5 Research Findings

3.5.1 Conceptual Aspects

The review of OS.UNIVERSITY design plans and project papers sheds light on the specific benefits it intends to bring into the system:

- **Businesses** would benefit from shaping candidates/employees expertise and from directly approaching their learning and development needs in a distributed manner. Middlemen would be cut out, thus reducing business expenses and latency.
- **Academia** would benefit from scaling their target audiences (hence the economy of scale, given the law of diminishing marginal utility is not applicable in the field of learning), gaining competitive advantage through modernization and automation of operations, combined with customization of the educational experience.
- **Learners** would benefit from receiving higher quality education (adequate to the needs of economy) and from directly approaching employers when it comes to matching the expectations with the individual learning and development profiles - all done directly through the Ethereum blockchain.

Strategic Level

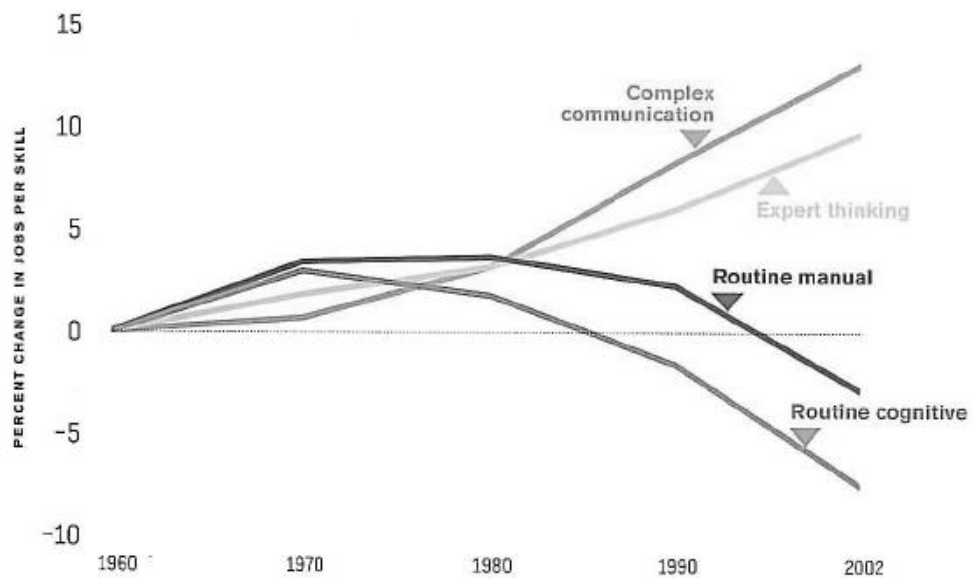
The education technology market spans more than 40 discrete market segments, involving different parties (EdTech Landscape, 2017). The Open Source University strategy is to involve all the parties into a distributed platform without any specific centralized dominant. The main parties benefiting from the project are the above mentioned³⁴, but their motivation to engage should be explained systematically:

- **Businesses** - operating in fast-changing times requires proactive stand on the human capital development side, considering that in a single generation businesses had to adapt to entirely new (digital) marketing channels, decide on how to invest in (and utilize) new technologies, and compete on a global stage — things that were barely imaginable a few

³⁴ It should be noted that the list is not exclusive, given that society as a stakeholder on its own is not mentioned, but for the purposes of the article analysis is limited to Academia-Business cooperation only.

decades back. Things have changed a lot since then and will continue to change with the rise of the 4th Industrial Revolution, hence the need of continuous L&D and the growing demand for skills of higher order (chart 5).

Chart 5. Visualization of the growing demand for higher order skills globally.



Source: Council on Competitiveness, Competitiveness Index. (2014)

- Strong corporate organizations are based on highly educated and motivated employees, which are turning ideas that seem to be impossible today into a reality tomorrow. Businesses would benefit from the Open Source University project by exploring and leveraging existing learning opportunities in a systemized manner, and by organizing new learning pathways, so called “open source degrees”, targeting and preparing the right candidates for the job.
- **Learners** - as a decentralized software solution, OSUni would take care of handling the information for students’ courses, certifications, and grades (coming from different learning providers – institutional, but also non-formal education, corporate training, etc.). Students would benefit from the system, given that their credentials would be organized in the blockchain and distributed to organizations that provide academic and professional development opportunities.

- The strong social innovation aspect of OSUni lies in finding the right development opportunities for the technically savvy, but also for the ones that are socially excluded or from underprivileged groups. For those that are not traditionally enrolled in higher education, incl. displaced migrants, people with disabilities, an even growing number of elderly, incarcerated, low-income households.
- **Academia** - OSUni intends to replicate the success of GNU/Linux in the world of Academia, providing opportunities to open source different areas of academic governance, related to the interaction with students and the private sector. It intends to do so, by introducing the social entrepreneurship approach - inviting educational partners to be part of a global movement, not of a privately run business project, which either fails or succeeds on its own.
- Hence, there is an open call to action / manifesto for Academia representatives to join '*a path to revolutionizing the educational system by turning it into a distributed network of contributors*'. Benefits for the Academia are structured around the digital transformation of the old inefficient system of paper registers, manually tracked information, and numerous dispersed platforms through which it is hard to find and organize content, into a single, yet decentralized space where all the information, related to each learner would be stored, curated, and available on demand. It would be like a 'personal wallet' for the learners, but instead of financials, containing information, associated to degrees, specializations, and courses that a certain participant has gained over the years. For Academia, this would be a suitable vehicle for expanding their production markets.

Tactical Level

Since the Open Source University project is a complex sociotechnical system (Fox, 1995), part of the tactical issues that are being investigated by its team are related to the gas consumption model that needs to be implemented in order to stimulate all parties to be involved into the learning process, and encourage them to provide content that is adequate to the market demands. According to project's documentation, the decision taken in that regards is to distribute gas consumption expenses as described:

- **Academia** - the gas³⁵ used for synchronizing courses data into the Ethereum blockchain would initially be paid by the educators, who provide the predominant amount of MOOCs and other learning experiences within the system. Whenever Businesses start to combine these into learning pathways, the associated expenses would be refunded to the Academia. In addition, businesses would pay commissions fixed by the learning providers whose offerings are being leveraged.
- **Businesses** - the gas used to create and modify degree blocks into the Ethereum blockchain would be paid for by businesses (and/or other organizations that are ‘knowledge consumers’ within the system. Businesses would eventually be covering the gas consumed by educators[GK ???]). In case a learner wants to approach a specific business organization, but there is not a match between skills’ supply and demand (i.e. all courses and requirements, defined by the business degree blocks are not met), gas used for the communication would have to be covered by the student. Whenever there is a match (students that completely cover business-defined learning pathways) and there is a communication ongoing, between student and business parties, gas expenses would be covered on the corporate side, presuming the profits would be on the corporate side.
- **Learners** - gas expenses, related to personal profile updates, courses progress, and payments for courses would initially be covered by the students. In the future, based on the ‘Generosity’ concept of the OS.UNIVERSITY, after a mutual agreement, businesses would be able to cover students’ expenses - partially or entirely. Certifications will automatically be written into the blockchain, cutting the bureaucracy and allowing all stakeholders to focus on the important aspects of life and business. Any personal information of the parties involved would be stored in an encrypted & secure way, i.e. data will be hashed – the hash function is among the most relevant technology aspects of blockchain.³⁶

³⁵ Gas is a measure of computational effort. The reward for the hard work of miners. Miners are the nodes who compete to solve math problems and get awarded.

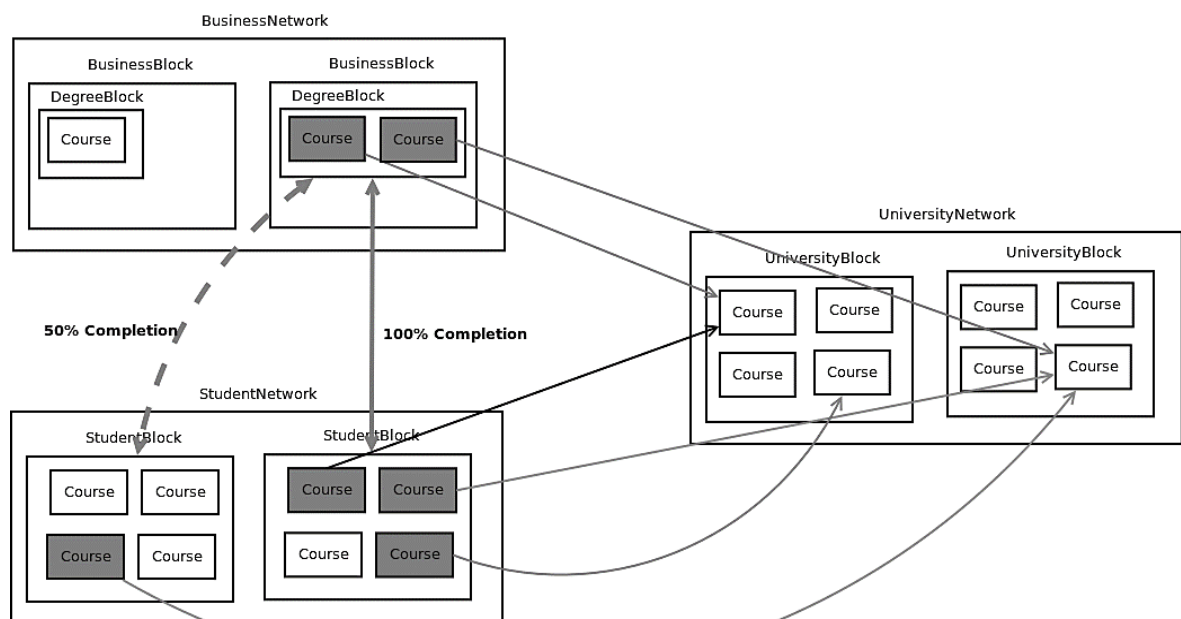
³⁶ A hash function is any function that can be used to map data of arbitrary size to data of fixed size. The values returned by a hash function are called hash values, hash codes, digests, or simply hashes.

Operational Level

OS.UNIVERSITY, being a distributed education and certification platform, operating on the public Ethereum blockchain, distinguishes 3 main networks where businesses, learners and Academia collaborate on operational level. An example of such collaboration is MOOCs and other high-quality learning opportunities, which are distributed over a number of online platforms and providers. These will be openly integrated into the OS.UNIVERSITY platform, using smart contracts. This will allow students to benefit locally from the global opportunities in a structured and systemized way. Businesses on the other hand, will be able to define distributed learning pathways and publish them on the Ethereum blockchain, allowing learners to complete those „open source degrees“ and receive certification that is distributively preserved and guaranteed. In case of a degree match, students and businesses will be able to communicate directly.

The critical set of smart contracts, facilitating the most important operational interactions between businesses, students and Academia, is called “OSUni Core”. It would be kept small and highly modular in order to mitigate the possibility and impact of potential „bugs“ in smart contracts. “OSUni Core” is intended to be publicly available and would go through multiple security audits on each release to ensure the users that the project pursues the highest quality possible.

Figure 9. Representation of the modular organization of the OSUni Core.



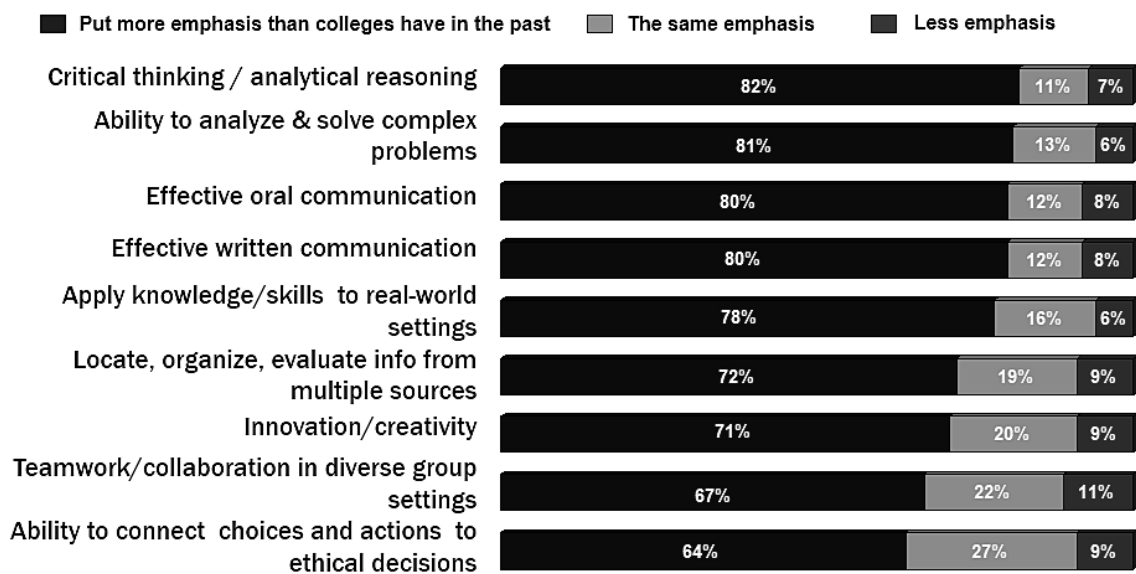
Source: OS.UNIVERSITY official white paper. (2017)

3.5.2 Technical Aspects

System architecture of the OSUni Core

Already 2 years in research, recognized as one of world’s top 10 social innovation projects by the Living Progress Challenge of Hewlett Packard Enterprise, OSUni harnesses the power of the decentralized blockchain to address what “Ernst & Young” (2017) found to be “*the main bottleneck in matching skills to jobs*” – information coordination relationships between educators, learners, and businesses. While changes in employer priorities are known (chart 6), it is the process of transforming the educational process in line with them that lags behind.

Chart 6. Employer Priorities for College Learning and Student Success.



Source: Hart Research Associates. (2013)

In order to achieve its goals, OSUni team has implemented the following architecture: OSU Token; Business Registry; Academia Registry; Learner Registry; Interview & Generosity layers.

OSUni Core Versioning Scheme

Given that all operational transactions are to be enabled through an ‘EDU’ (or an EDU-X) token, Open Source University’s own token, this opens up potential for scaling up a decentralized social innovation project into the world’s biggest educational marketplace where transactional costs are brought down to almost zero. Not to mention that geographic, socioeconomic and institutional borders simply do not apply.

Starting with an audience of 60+ million learners, enrolled in more than 7000 massive open online courses, OSUni as a solution has the potential to reach up to 3 billion Internet users across the world. But in order to do so, it needs well-organized maintenance and servicing processes. Therefore, in order to integrate users and functionalities flawlessly, OSUni Core is going to use semantic versioning model. Below is an overview of the model.

DAPP & Hyperlog

Detailed data is planned to be kept in the blockchain in a multi-master, append-only database called ‘hyperlog’ based on ‘MerkleDAG’ objects, composed by many DAGNodes that are linked using Ethereum blockchain technology. To ensure consistency, the overall result would be verified through the ‘OSU Interview’ module. Involved parties would be able to log information, which will be used during every business \Leftrightarrow learner “*interview*” process.

Exchanging private data sets peer-to-peer would redefine the Ethereum blockchain network and bring much needed privacy for the sensitive information, along with full transparency of the transactions. Nevertheless, this approach is expected to improve scalability, because ‘hyperlog’ functionality is essentially an equivalent to sharing. The “Scalability” review contains more details on how the data would flow among the stakeholders, whose profiles are briefly outlined from content perspective below:

- **Business profiles** - when it comes to recruitment, businesses would be able to target the right candidates for a specific position by organizing all the learners that are available in the blockchain under unique addresses. ‘OSU Business Registry’ would be taking care of recording company profiles into the blockchain, aggregating students by skills and using ‘hyperlog’ (peer-to-peer connection) + ‘node-rsa’ (for generating 512 bit-length keys for the sensitive information) in addition to ‘MapReduce’ (condensing large volumes of data into useful aggregated results) in order to handle big data smoothly on the client side.
- One of the most valuable benefits is that ‘OSU Business Registry’ saves significant amount of time and money for the businesses in the process of connecting the right candidates, excluding the third parties.

- **Academia profiles** - Educators would eventually start to reap the benefits of joining the blockchain the moment the businesses start to add preferable learning experiences, aggregating blockchain data, according to their needs and requirements. When businesses combine specific courses into custom specializations, adapted to their profile, fees that are already set would be paid to the institutions and experts, supplying the content. The fee (when such is charged) would be decided upon by the educators and would be publicly distributed over the Ethereum blockchain. It needs to be highlighted that for the initial upload of new content, educators supplying it would cover the gas consumption.
- **Learner profiles** - it would be possible for the students to pay for specific courses or programs/ specializations/ open source degrees (i.e. block of courses) with all conventional currencies including ETH, BTC and LTC. Within the structure, information for every learning opportunity will be specified and available for recording onto student's profile when enrolled/subscribed.

Security

Securing OSUni Token and sensitive information distributed over the blockchain is of highest priority when it comes to turning a highly innovative project (to the point of being experimental) into a success.

Therefore, OSUni team is planning to make three step security audits. It is known that developers of smart contracts must be more security focused than their traditional software counterparts as over the blockchain design and programming paradigms evolved exponentially.

Unlike the traditional software lifecycle, where version upgrades are the norm, smart contracts are immutable once deployed. Smart contract architecture must be highly modular foreseeing future changes, if any, can be isolated to small areas {GK eh??} . OSUni testers of smart contract security are fluent in the new paradigm of distributed trust computing, showing proficiency in frameworks, such as Open Zeppelin and Oyente, and strongly believe that:

'Raising awareness and responsibility of smart contract security are essential steps in building a solid defense against future attacks'.

In conclusion, it can be highlighted that from an operational perspective, the “OSUni” network will have several layers, the first one being the ‘OSUni exchange’, which would be built on Ethereum smart contracts, containing few solutions allowing us to have flexibility adding few layers on top of one scalable base. In short, OSUni is adding unique functionality to an already working Ethereum blockchain. By nature its extension, using hyperlog and ‘MapReduce’, will be processing and aggregating big data sets to retrieve the right information to OSUni clients, and will remain scalable and maintainable - by all nodes in the ecosystem.

3.5.3 Monetary Aspects

Finally yet importantly, the form of financing the OSUni project operations was considered. For its strategic agenda to be transformed into an operational plan with clear milestones set and followed (*according to the attached Gant chart*), a token generation (or token-sale event) is being held on the OS.UNIVERSITY platform in the period of November - December 2017. 33,000,000 EDU/EDU-X tokens³⁷ are planned to be distributed during the ICO with a price set at the rate of 1 ETH for 1350/750 EDU. The funds are to be invested as described on Chart 7.

Chart 7. Distribution and funds allocation models, designed for the token sale and beyond.



Source: OS.UNIVERSITY official white paper. (2017)

³⁷ OSUni team have invested in seeking out legal and compliance expertise to ensure that EDU token meets the new regulatory rules of the Initial Coin Offering at the ICO-stage. According to the professional opinion of its legal advisors, based on the Howey Test, EDU tokens should not be deemed as securities and do not need to be registered as a security. OSUni team underlines within its project documents that it focuses on the legislative regulation of the ICO, digital tokens and operations with cryptocurrencies to provide its users and contributors safe and reliable solutions for ‘Crowdfunding 2.0’.

3.6 Conclusion

Nowadays e-learning content providers (with products ranging from MOOCs to master degrees) are making significant progress in innovating within the academic world to strengthen the relationships among the key stakeholders. They are building high quality courses and alternative learning experiences, such as „*micro-masters*“ or „*nano-degrees*“, covering the practical applications of the skills every learner needs to gain. Harvard, MIT, Berkeley, among others, are some of the schools that learners have at their fingertips by accessing the „EdX“ platform over the Internet, for free. 400,000+ certificates have been proudly earned by edX students (as of 2015). „Coursera“, another of the top projects in terms of numbers and credentials, is partnering with the U.S. State Department to create “learning hubs” around the world – a project through which students get internet access, take courses from 100+ top universities and other educational providers, and participate in weekly in-person study groups to make learning even more collaborative. Such social innovations are materializing on a daily basis, but they lack strategic direction on a global level, which is hard to formulate without a common infrastructure that enables spillover effects.

Within the decentralized OS.UNIVERSITY ecosystem, the OSUni token (EDU) will be used to help shape all these opportunities into vendor-neutral knowledge products that are scalable, transferable, and considered trustworthy across institutional and national borders. It is here where the parallels with „free money“ theory and practice are strongest – in both cases highest effectiveness is expected to be achieved when centralized institutions are not leading the way, i.e. they are separated (Nenovski, 2001). The OSUni token will facilitate the connections within the educational system, bridging the gap between businesses, learners and educators (providing MOOCs, but also traditional learning experiences). The current study outlined OSUni main value propositions, looking at project’s strategy, tactics, and operations agenda:

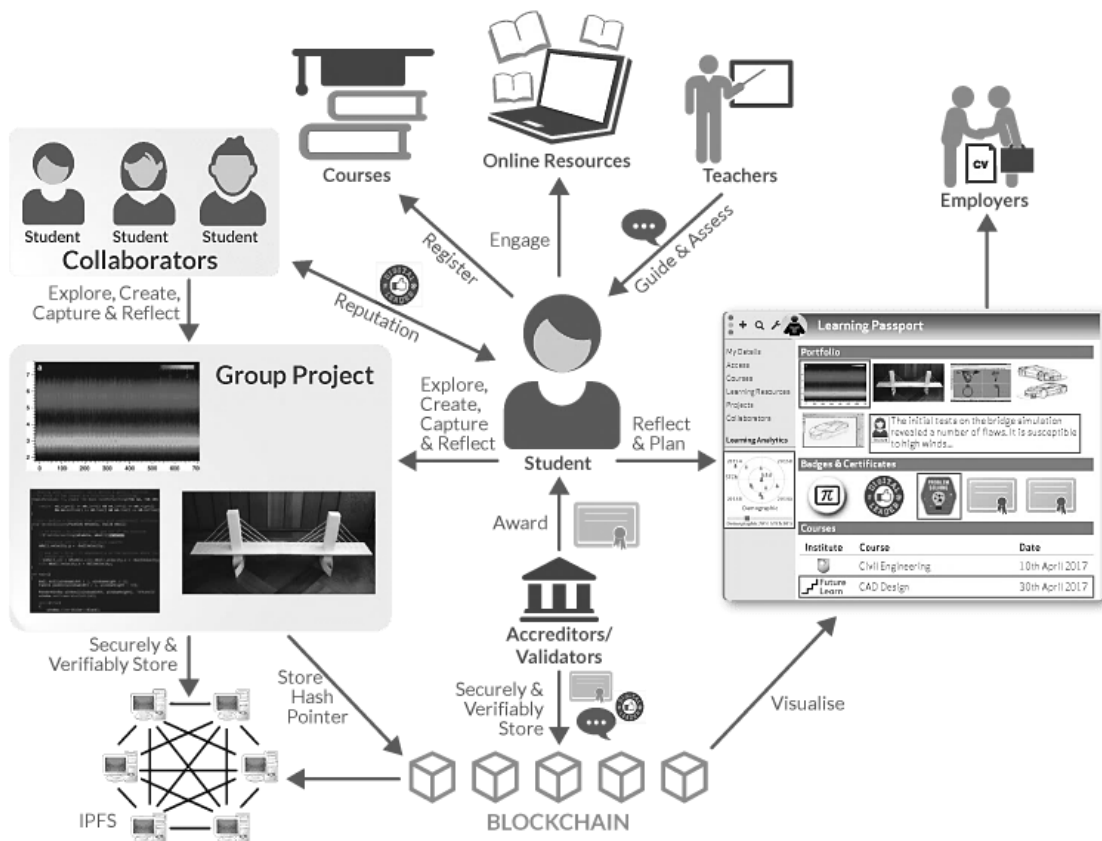
- **Academia** will be able to create courses and programs and feed key information, related to those, into the blockchain, expanding its market.
- **Learners** who enroll into specific courses or learning pathways (provided for free or with a fee) will have all the information about their expertise and progress systemized within the blockchain.

- **Businesses** will therefore be able to target the right candidates upon common agreement, while private information will be kept secured behind the addresses of transactions³⁸.

More insights can be gained and analyzed only when the number of participants within the OSUni system increases sufficiently, given the space for exponential growth and potential applications of one such platform (as outlined on fig. 10).

The OS.UNIVERSITY token is capable of bridging the gap between business and Academia by bringing transparency and reducing costs – something that the technology it relies on, i.e. the blockchain, has the potential to achieve beyond the financial world. However, we are yet to witness when this technology is going to deliver on its promises – something that depends on all parties’ decisiveness.

Figure 10. View on potential scenarios for stakeholders’ interactions on the blockchain.³⁹



Source: The Open University, Open Blockchain. (2017)

³⁸ According to project plans, businesses will also be able to publish courses and open source degree blocks, and refund the educational process for promising candidates/employees (partially or entirely).

³⁹ This view is limited. It does not include some important aspects of the relations within the blockchain ecosystem, such as the process of “mining” - adding transaction records to a public ledger of past transactions. This ledger of past transactions is what is called a blockchain (as it is a chain of blocks).

PART 2. PROJECT DEVELOPMENT

“The best way to predict your future is to create it.”

(Abraham Lincoln)



OS.UNIVERSITY's tagline, „World's Academic & Career Development Ledger”, reflects team's vision to create a one-of-a-kind decentralized platform, providing digital credentials wallet⁴⁰ as a service to learners throughout the world without any limits to what level / fields of studies they are engaged into. It also enables them to find the best learning & career development opportunities by being connected to Academia and business representatives that have trust in their learning and development identity.

⁴⁰ The term 'wallet' is used in the sense of a personal passport or portfolio to store traceable educational and career development information. In the blockchain world, a wallet is a file that contains a collection of private keys and communicates with the corresponding blockchain. Wallets contain keys, not coins; they require backups for security reasons.

Based on the research presented in Part 1, you may have already made up your mind, regarding the OS.UNIVERSITY platform—world’s first distributed academic & career development ledger, with potential to transform the way 7 billion people develop academically and grow professionally.

But how would this transformation, envisioned in Part 1, really look like? How would a tokenized marketplace for businesses, educators and learners, equipped with sophisticated matching algorithms, excluding middlemen, work in a socially responsible, yet profitable way —a question that this introductory section answers in 3 to 5 minutes, in case the 30-page white paper to follow ² is not your first choice.⁴¹

▪ **Smart Contracts Definitions & Interaction**

The diverse team of renowned academic, corporate, technology, NGO and public sector leaders (presented just a few pages below) is about to roll out a first of its kind global higher education and professional development platform, based on the Ethereum blockchain⁴², that will serve two main product functions:

- As a distributed database that enables Academia, learners, and businesses to record and verify educational and professional development credentials. This in turn will enable, for those users who so desire, businesses to locate suitably qualified learners through highly targeted searches.
- As a global marketplace upon which high quality academic and broader L&D offerings will be made available, bought and sold with the help of the EDU/EDU-X token that will enable transactions on the platform and will be traded on leading cryptocurrency exchanges.

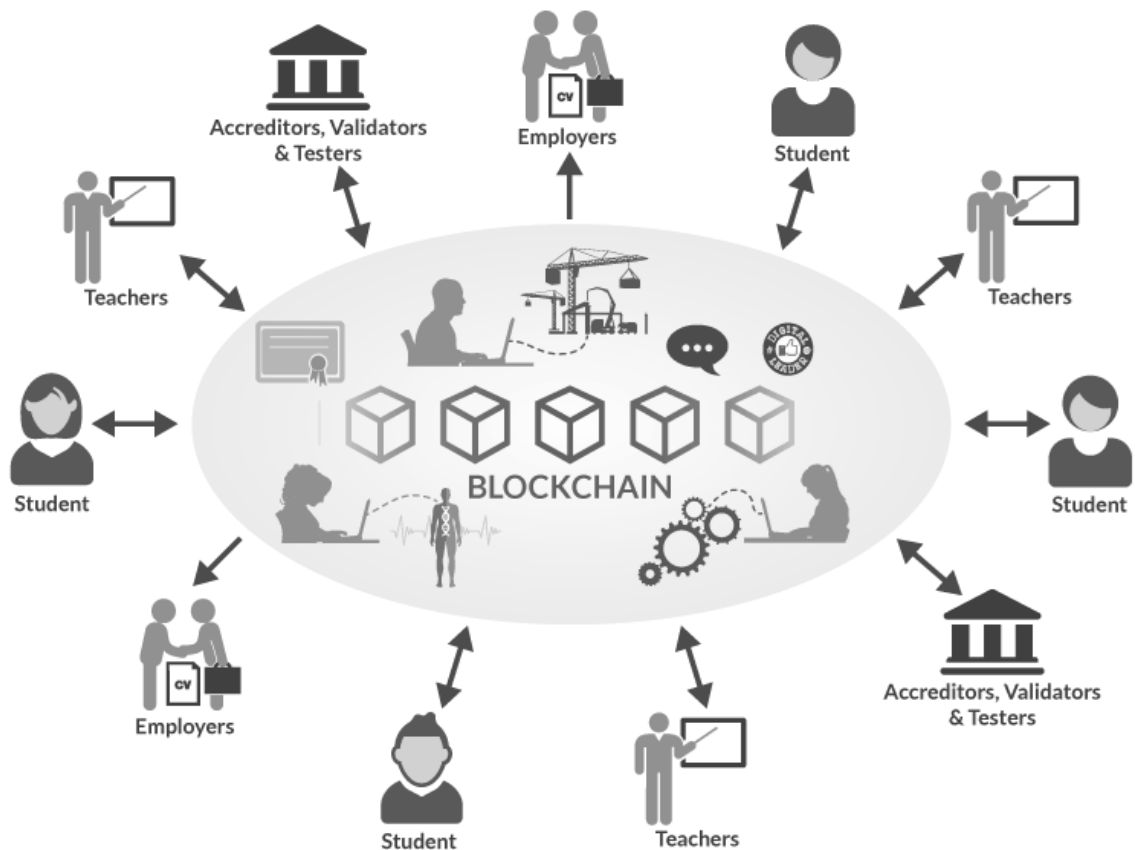
Starting with the integration of ~700 of world’s top universities and 60+ million MOOC learners, our blockchain-based platform is introducing the concept of the “Distributed University”—one that enables transferability of knowledge & skills throughout institutional and national borders, reduces operational costs and opens up the access to high quality education and career development opportunities to hundreds of millions.

⁴¹ The version of the white paper, included in Part 2, is current as of March 1st 2018 and does not reflect any changes made after the publication of the book.

⁴² Due to its broad adoption, the Ethereum blockchain is a starting point from development and implementation point of view (visit <http://ethereum.org/>). However, the team behind OS.UNIVERSITY aims to create a multi-chain solution, enabling interoperability and integration with data, hosted on other public and private blockchains.

The more the OS.UNIVERSITY marketplace scales in a global trillion-dollar market, the more its EDU(X) token value is expected to rise, hence the idea for an initial coin offering (ICO) through which tokens can be offered at a set price—sharing the cost, but also the benefits from launching such a global social innovation project.

Figure 1. Key beneficiaries of the blockchain application in the academic world.



Source: The Open University, Open Blockchain Initiative. (2017)

▪ **Proof of Concept: Three Years of Research & Validation**

From corporate and social perspectives, the R&D project has been recognized by Hewlett Packard Enterprise (HPE) global community as one of world’s top 10 social innovation ideas and has been awarded by AIESEC and their partners from Ernst & Young (EY) as the innovative solution to enable better information coordination relationships between Academia and businesses, which is the core reason for mismatch of skills demand & supply, according to EY consultants.

From academic perspective, the project has been peer-reviewed by the European scientific community and featured in journals in Bulgaria, Latvia, and

the Czech Republic – *readings can be found in Part 1*. In addition, Sony Global Education⁴³ and the Open University are working on smaller-scale blockchain-based ed. tech. solutions of experimental and commercial character to assist in addressing the challenges that the team has successfully identified and that it is addressing systematically with the global launch of the OS.UNIVERSITY platform.

▪ **Market Opportunities**

The project offers potentially transformative value generating proposals to all three participating categories of the higher education and professional development value chain, enabled through three main Ethereum smart contracts, which our team of blockchain technologists has developed:

1. Academia will be able to:

- Market their offerings globally and at ultra-low cost, given that attracting students via conventional methods in the Digital era is increasingly difficult and inefficient;
- Benefit from the reliable transferability of modular L&D achievements between universities and other learning providers, reducing admin. costs and assisting smooth continuance of learning for mobile students and life-long-learners;
- Modernize educational operations—from organizing distributed offerings on demand to improving internal record keeping with substantial cost savings.

2. Businesses will be able to:

- Receive instant access to a global pool of talent with credentials verified through the ultra low cost system built on top of the distributed database;
- Leverage highly specific search facilities, allowing business to identify and seek to contact qualified candidates, therefore disintermediating conventional slow, expensive and less specific recruitment methods;
- Generate massive cost savings in corporate L&D operations—from finding and paying for educational services to monitoring the progress of employees' certification.

⁴³ Visit: <https://www.sony.net/SonyInfo/News/Press/201708/17-071E/index.html>.

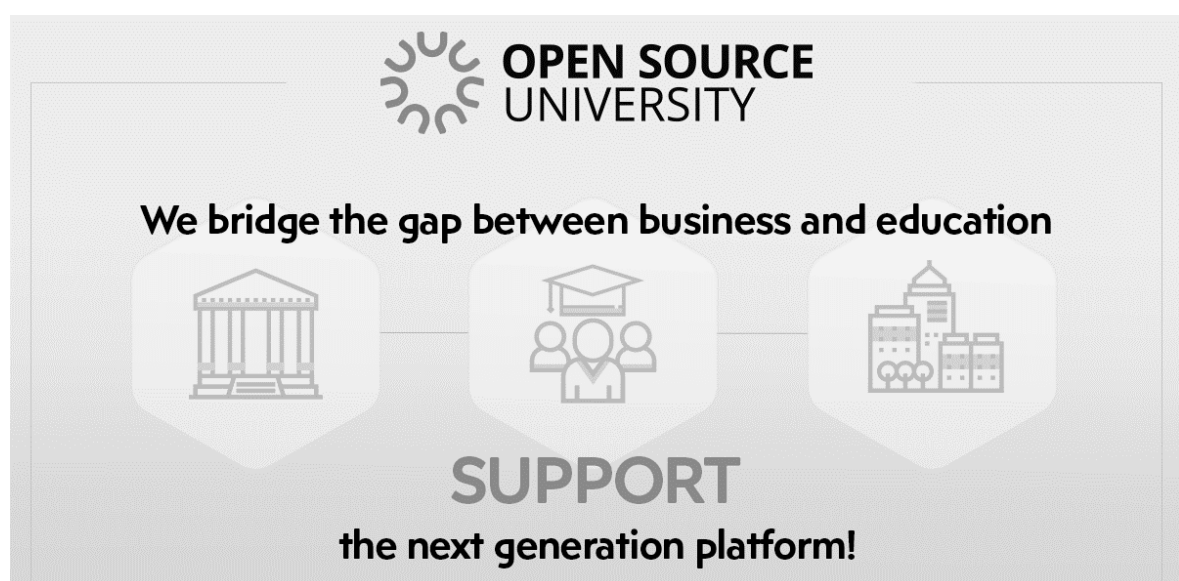
3. *Learners will be able to:*

- Access some of world’s best L&D opportunities irrespective of where the learner is, no matter what barriers exist—geographic, social, economic, or political;
- Get incentivized in the knowledge that potential employers are more likely to find them through targeted searches on the platform than via conventional recruitment methods;
- Learners would control the access to their secured credentials information, but would be able to promote their blockchain-validated portfolio of accomplishments.

The Open Source University project is proud to collaborate with some of the leading corporations, universities and research centers, among which: Cobden Partners (London-based investment consultancy); VUZF (University of Finance, Business & Entrepreneurship); Brain Workshop Institute (Sofia-based free market think tank); Investor Media Group (Bulgaria’s leading media corporation);

While the team behind the project is proud of its institutional partnerships, what it is aiming at is to reach and win on its side the educational and technology enthusiasts and experts that dream and work for a better world where opportunities are distributed fairer, counting on their support to build the ‘University on the Blockchain’ – *a promotional material is visualized on Image 1.*

Image 1. Promotional material, focused around bridging the business-education gap.



Source: Project archive. (2017)

CHAPTER 1.

TECHNICAL WHITE PAPER

Section 01. Vision

Today over 3.16 billion Internet users from all ages, but more specifically young people, are still waiting for a global solution to revolutionize the way they learn, develop, progress and succeed in life. Despite living in the Information Age, 4-5 years of on-campus programs in a single-institution setup – be it public or private, are becoming a growingly inconvenient solution for an increasing number of people. That applies especially to attractive, highly-desired areas, such as IT, in which young professionals are entering the workforce, often relocating, before finishing their full studies. That leaves them to choose between a successful career and the completion of their formal degree.

Indeed, there are more than 150 platforms with a global scope of operation that provide free or open educational content and are considered to be established online brands. However, the main idea behind platforms like “EdX”, “Coursera”, “Novo Ed”, “Udemy”, etc. is to provide an opportunity for the educational content creators – colleges, public/private/individual educational content providers, to meet the end users, who can enroll in different courses.

One of the United Nations’ Sustainable Development Goals is to assure everyone inclusive and quality education and to promote lifelong learning. This goal corresponds with our vision of using the Open Source University platform for donations. They will be in the form of free education paid for by businesses and organizations while the educational system (Academia) will reap financial benefits based on rate and successful candidates. Having in mind that “Universitas” stands for “*the whole, the universe, the world*”, our intention is simple – to re-establish this classical community of teachers and scholars in a way which is fit for its purpose in the information age we live in.

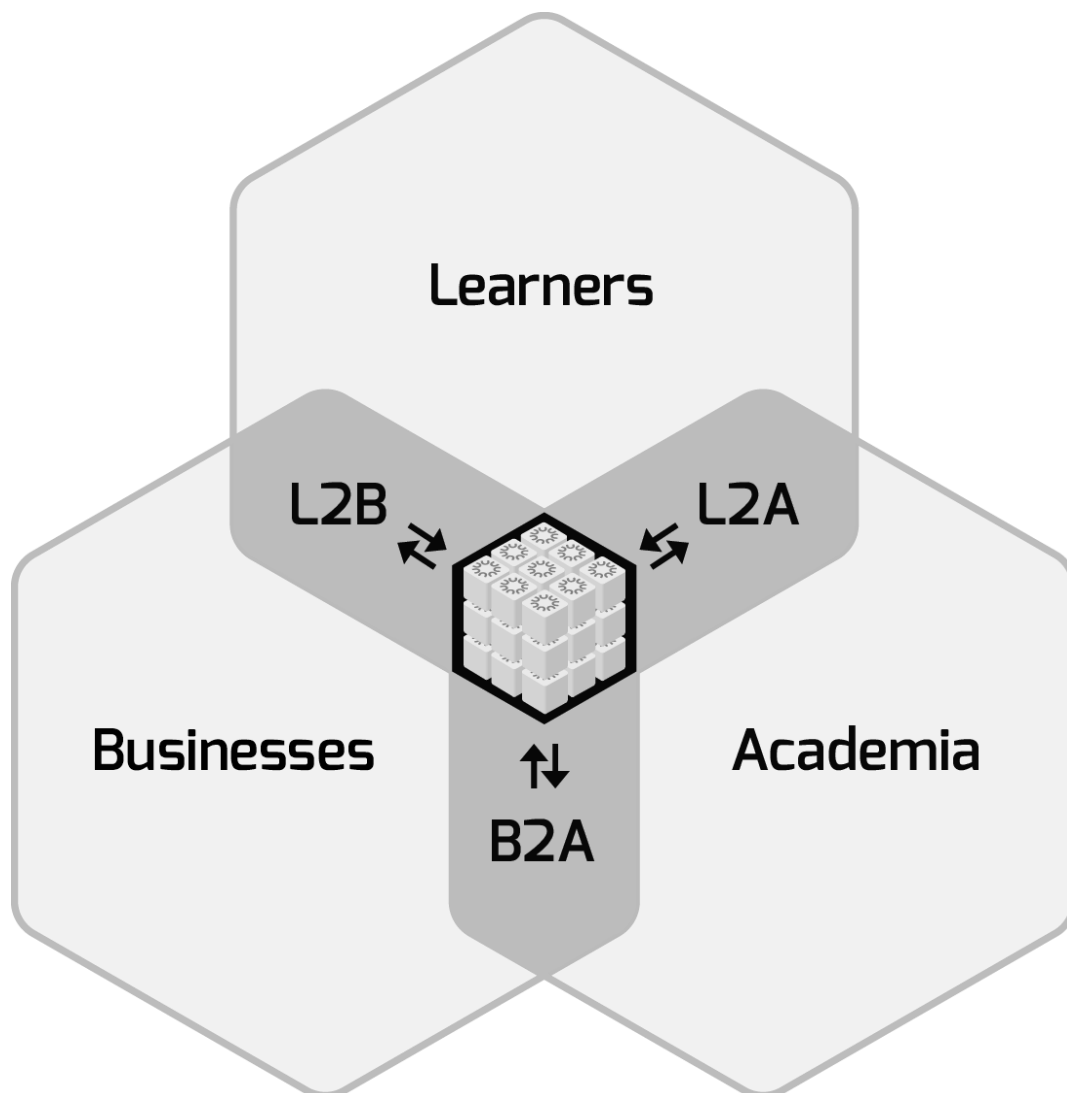
The crypto-revolution that is happening has the potential to achieve that goal. It will change things around by making education affordable, more beneficial by reducing the workload of third parties and will achieve traceability of all certificates. Decentralization, cryptocurrencies and smart contracts are the new solution for educating people and making them qualified for the constantly changing business demands.

To give a better overview of the counterparties, we will provide an explanation about the used terms and what they represent.

- **Business** - include small, medium and big companies operating in all areas of science, technology, construction, healthcare, automotive etc.
- **Learners** - include students and people gaining new knowledge, lifelong learners and curious minds who are seeking new professional paths.
- **Academia** - include all available MOOC platforms, high schools, universities, internal training program providers, etc.

The connection between the counterparties can be summarized as follows: Business and Academia (B2A); Business and Learners (B2L); Learners and Academia (L2A) – *interlock visualized on figure 2.*

Figure 2. Interlock between the key smart contracts within OS.UNIVERSITY eco-system.



Source: Project archive. (2017)

Section 02. Why Blockchain?

The true potential of cryptocurrencies is still not fully revealed and expands far beyond the financial sector. The Ethereum blockchain technology brings trust between untrusted parties and can facilitate potential agreements and all kinds of communication between businesses, educators and learners. That in turn saves time, money and any misunderstandings are avoided. Nowadays these benefits are some of the most valuable assets an organization could possess.

This new technology introduces transparency and removes delays as well as third party commissions between businesses, educators and learners. Blockchain enables us to regulate participants and give them more options in this microenvironment by introducing clear and highly customizable framework to automatically connect all the participants (businesses, learners, Academia). All information, which is saved on the blockchain, is immutable and transparent for everyone. This technology will give real-time information about the most important KPIs of all the participants. For example, it can give real-time information about the performance of every single employee in a business, which is part of the Open Source University network. Our highly customized smart contract will also take care of verifying and storing all of the learners' certificates on the blockchain, making them immutable and accessible to all businesses and organizations. The feature is for innovators who dare to change the old rules and bring benefit to all valuable parties.

2.1 Recruitment Smart Contract – Businesses and Learners (B2L)

OS.UNI highly advanced matching algorithm between business and learners will be implemented in a smart contract, which will take care of the whole interaction. The connection between a learner who has a set of skills in the blockchain and a business with matching requirements for these skills will be done automatically by our B2L smart contract.

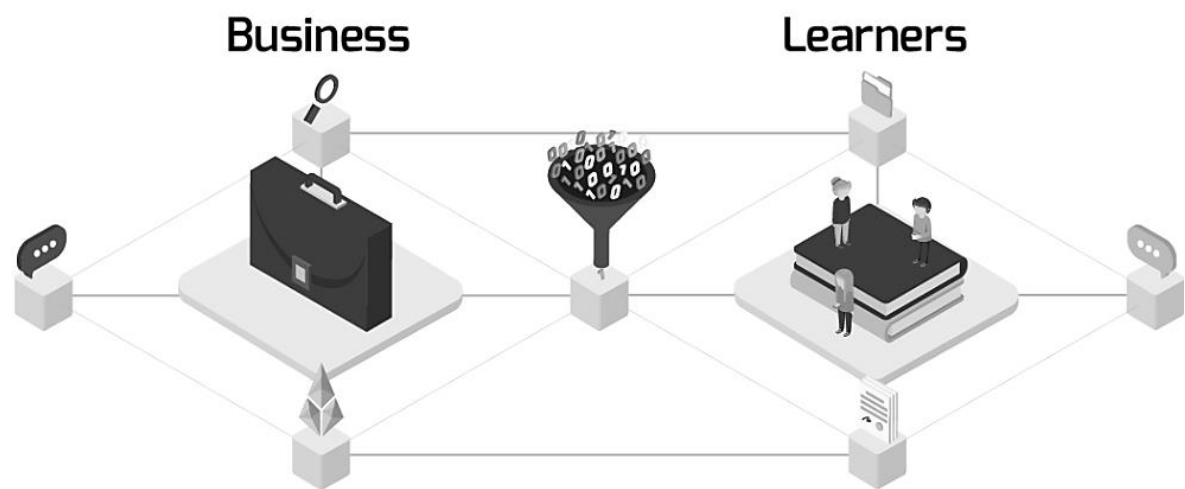
The first and one of the most valuable benefits of this smart contract is that it significantly facilitates the work of third party recruitment companies. This drastically reduces business expenses in the process and brings a higher percentage of successful candidates. From a business perspective this automatically removes the necessity to publish job openings and desperately trying to reach the right candidates.

The B2L smart contract will also be used to keep track of employee performance, which can lead to transparent social benefits for top performers. It is a completely secure system built on top of the blockchain, allowing businesses to have up-to-date knowledge about their employees. The natural evolution of the business provoked by our B2L smart contract will be represented by better interaction with other businesses (as strategic partners).

End result for the business (in B2L) will be:

- Advanced matching algorithm (approaching the right learners);
- Dramatically lower recruitment expenses;
- Increase success rate of new candidates;
- Real-time performance indicators for current employees;
- Transparent social benefits for top performers;
- Up-to-date knowledge base in-house;
- Transparency in the interaction business-to-business (B2B).

Figure 3. Business-to-learners smart contract visualization.



Source: Project archive. (2017)

Learners will use an advanced matching algorithm to find the best position in accordance with their experience and knowledge, saving hours of searching on different platforms. The biggest opportunity for the learners is getting approached by businesses based on their performance.

Our B2L smart contract will secure learners selected by the business with the option to allocate part of the hiring bonus as a compensation for the candidates during their probation period.

End result for the learners (in B2L) will be:

- Advanced matching algorithm (selecting the right position with one click instead of switching between numerous job finding platforms);
- Direct connection of all learners with the business;
- Transparent social benefits and compensations for employees;
- Learners can be approached by business in a very early stage of their education (gives real-life experience and possible career path before graduation);
- Direct connection between what you learn and the professional opportunities you have.

Table 1. Challenges in recruiting and retaining employees, harming the job-market.

Nowadays	Future with b2l smart contract
<i>65% of the employers claim talent shortage is the biggest challenge in hiring.</i>	<20% of the employers will report talent shortage because of the connection the infinite pool of fresh talents updating their skills every day on the blockchain.
<i>62% of employers felt the labor market was candidate-driven.</i>	Business and learners will form the market by constantly changing demands. Our B2L smart contract will let businesses and learners (featuring employees and business owners) generate new ideas and actively collaborate.
<i>64% of the companies only measure employee engagement once a year.</i>	All businesses on the blockchain will be able to measure all-important KPIs for them in real time.
<i>Almost 60% of the job seekers report having poor candidate experience.</i>	B2L smart contract will ensure the connection between businesses and learners by common areas of interest

by avoiding common mistakes made during the old hiring process.

74% of the workforce are open to making a career move.

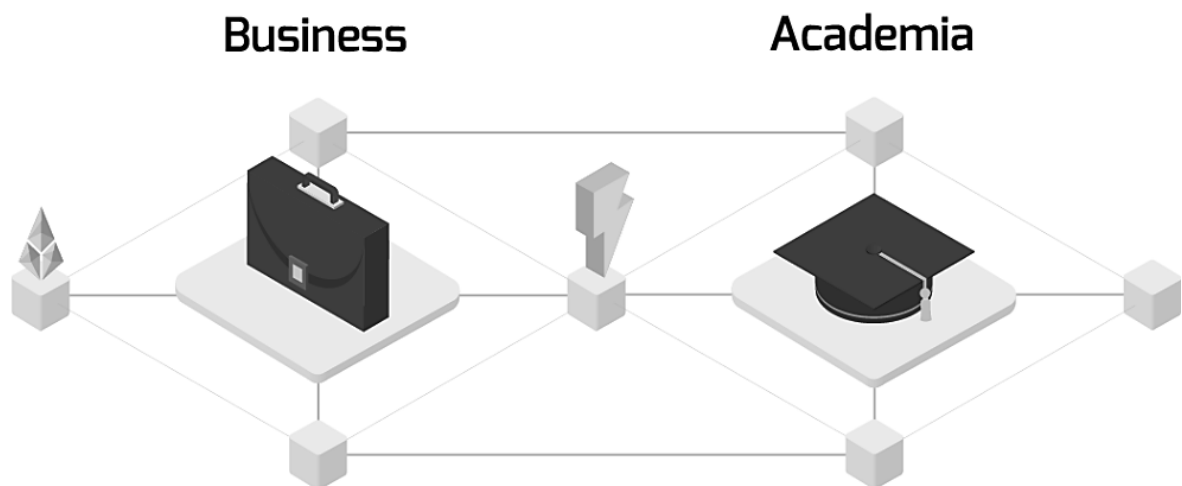
<15% of the workforce will be open to make a career move because the matching algorithm will pick the right candidates by measuring their interests.

Source: Own research. (2017)

2.2 Content-On-Demand Smart Contract - Business and Academia (B2A)

OS.UNI solution will give advantage to the businesses to pick the right candidates directly from the student desks and involve them in real-life situations. This ability to select candidates will be valuable for businesses, which will have highly specialized employees. Businesses will have a talented pool of learners from which they can hire the right candidates. B2A smart contract will also facilitate the process of organizing internal specializations and trainings, which in turn will build in-house knowledge.

Figure 4. Business-to-Academia smart contract visualization.



Source: Project archive. (2017)

End result for the Business (in B2A):

- Solving scalability constraints;
- Access to an infinite pool of new talents;
- Ability to approach learners by top performance results;

- Customizing semi-completed learners.

On the other hand, we have the Academia, which will be paid by the Business for the opportunity to reach top talented successful candidates. High quality education provided by Academia will increase exponentially along with the increasing financial benefits from businesses and rating scores (immutable and transparent for everyone).

End result for the Academia (in B2A):

- Scalability and education corresponding to the real-life demands;
- Financial benefits given by the business when matched with the right learner;
- Partnership with businesses to organize internship programs;
- Prestige (rating which will be updated in the blockchain).

2.3 Educational Smart Contract - Learners and Academia (L2A)

L2A smart contract will bring transparency and traceability in the entire microenvironment between learners and educators. It will help the old educational system to enter the new technological age by achieving complete transparency, security and flexibility provided by the blockchain.

Academia will have absolute traceability of all the participants' results from their courses and degrees. Our smart contract will create endless possibilities to take already designed functionality to a completely new level of instant contact between educators and learners. For example, learners participating in a specific course or degree can securely save certificates and diplomas into the blockchain and have real-time feedback about ongoing courses and how they can improve their performance.

End result for the Academia (in L2A):

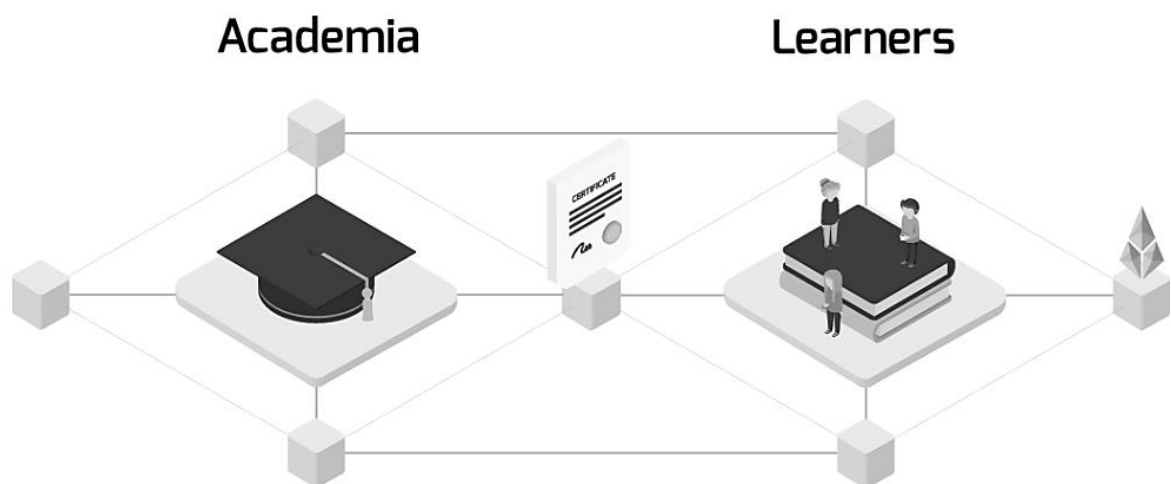
- Traceability of all participants for courses and degrees;
- Real-time performance information related to courses and degrees;
- Transparency of all skill sets of the learners;
- Automatically suggesting suitable candidates for newly formed courses and specializations;
- Feedback from learners about future improvements, features and ideas.

Learners who are using L2A smart contract will have the ability to get instant information about newly formed programs. By storing their certificates on the blockchain, learners can get feedback about their current performance in their ongoing courses and can receive advice about how to get the best result. Another benefit of the L2A smart contract is that groups of learners can be formed automatically by areas of interests and these groups can be matched to specific internship programs and real-life specializations.

End result for the learners (in L2A):

- Authentic and immutable skill set, saved on the blockchain;
- Instant access to all new programs, related to the area of interest;
- Feedback on how a particular learner can improve his/her performance.

Figure 5. Learners-to-Academia smart contract visualization.



Source: Project archive. (2017)

These are just some of the use-cases to start with. Beyond them, the system has the potential to eliminate the friction and costs of current third-party intermediaries when considering student records management, and other personal identifiable information or sensitive data.

There are undisputable promises of improved data integrity, reduced transaction costs, decentralization and disintermediation of trust. By being able to coordinate, store, and share student events, institutions essentially alleviates unnecessary and duplicate services, which in turn lower cost and increase cyber security.

Section 03. Strategy

The whole education technology market encompasses more than 40 discrete market segments, involving different parties. The Open Source University strategy is to involve all the parties in a distributed platform without any specific centralized dominant.

3.1 Involved parties

The main parties, which will benefit from the project, are:

Businesses

- We live in rapidly changing times, especially for businesses. Let's just consider that in a single generation, businesses have had to adapt to entirely new (digital) marketing channels, decide on how to invest in (and utilize) new technologies, and compete on a global level — things that were unimaginable a few decades back. Things have changed a lot since then and will continue to change with the rise of the 4th Industrial Revolution.
- The core of business organizations consists of highly educated and motivated employees, who are turning ideas, that seem to be impossible today, a reality tomorrow. Businesses will benefit from the Open Source University project by exploring and will make good use of existing learning opportunities by organizing new learning pathways, shaping current demand of specialists and approaching the right candidates without any third party organization or job opening advertisements. That in turn saves time and money. One of the greatest benefits in the system we are developing is that part of the financial resources, which every business will save in the process, can be invested back in employees and educators. This will give boost to the educational system and will motivate the workforce as well as people to learn.

Students and Lifelong Learners

- OS.UNI wants to establish the first blockchain solution in the educational sector, which creates opportunities for all. This unique decentralized software will take care of handling the information for all courses, certifications, and grades students have (coming from different learning providers – institutional, but also non-formal education).

- Students will benefit from the system, because all their achievements will instantly be saved on the blockchain and distributed to organizations that provide academic and professional development opportunities. All achievements of the learners will be stored and distributed over the blockchain to all working in the same area business organizations with respect to the privacy of every single learner.
- The strong social innovation aspect of the Open Source University is that it will help in finding the right development opportunities not only for the technically savvy or for the ones with access to high quality education, but for millions of learners from socially excluded or underprivileged groups. Others who are not traditionally enrolled in higher education are included as well, including displaced migrants, people with disabilities, a growing number of elderly, incarcerated, facing social stigma, low-income households, etc.
- Open educational content comes from learning providers from all over the world, in various different languages and platforms. Now is the moment to bring all this knowledge, spread over the network, together in one place, store it in the blockchain securely and to connect promising students to the right professional opportunities regardless of religion, location or social status. This process will happen automatically and will allow learners to figure out how to better present themselves to the businesses. Our smart contracts will handle the entire process of promoting the right learners to businesses over the Ethereum blockchain.

Academia

- OS.UNI will be the Linux of Higher Education – providing the opportunity to open-source all areas of the Academia governance, related to the interaction with students and public and private sector demands. Marketing-wise, it would be a decentralized “Amazon for Learning”.
- Nowadays e-learning content providers (with products ranging from MOOCs to master degrees) are making significant progress building high quality courses and alternative learning experiences, such as micro-degrees and nanodegrees, covering the practical applications of the skills every participant is going to gain. Harvard, MIT, Berkeley, among others, are some of the schools that you have at your fingertips through

the EdX platform. 400,000+ certificates were proudly earned by EdX students up until 2015. Coursera, one of the other best practices, partners with the US State Department to create “learning hubs” around the world – a project through which students can get internet access, take more than 500 courses from 100+ top universities and educational organizations, and participate in weekly in-person study groups to make learning even more collaborative.

- Furthermore, the numbers below that highlight the success of some of the leading learning content providers, speak for the great need to support and advance the expansion of the sector for the good of society:
 - Udacity started, based on a successful pilot online course in Stanford that attracted 160 000 students from more than 190 countries.
 - Coursera has 24 million registered users signed up for its programs, and offers more than 2 000 online courses.
 - Open edX is an open source platform that powers edX courses, which has more than 10 000 000 users. Through the platform, the percentage of students required to retake a particular course dropped from 41% under the traditional format to 9% for those taking the edX blended course offering.
 - Udemy has over 7 million students & more than 30 000 courses as of 2016. Furthermore, there are more than 16 000 instructors and 80+ course-on-demand languages, excluding the “Udemy for Business” corporate training/learning portal.
- OS.UNI invites members of the Academia into a distributed network of contributors, which contains impeccable and up-to-date information about the achievements and skills every learner gained along his/her road to excellence. The benefit for the Academia is that OS.UNI will transform the old inefficient system of paper registers, manually tracked information, lost data, into ONE shared place where all the information, related to each learner will be safely stored and available on demand. Our system will be like a personal wallet, but containing all the information, associated with every degree, specialization, or course that this participant has gained over the years.

3.2 Development Phases

The learning process has never been easier and more transparent. Now, Blockchain will prove the record of accomplishment for every learner in real time. Our solution will disrupt standard education and will make qualitative connection between business, learners and academia.

By using peer-to-peer technology and by encrypting sensitive information OS.UNI will be able to directly connect specific businesses, academia and learners with matching skills, interests and requirements. Businesses will be able to sponsor the right candidates via smart contract without third parties and numerous platforms for job finding. At the same time all status updates related to the specific candidate (gaining new courses or obtaining a specific degree) will also be handled. These updates will be sent via smart contracts to academia and businesses, which will result in immediate updates in all ledgers.

Academia will earn financial bonuses from all learners who have been chosen by the business and have passed interviews for a specific position. Academia will have a larger audience of learners who will be more involved because they will know that results gained by them will go directly to the business that is constantly searching for new talents via the Ethereum blockchain. The decentralized application (DApp) along with multiple smart contracts will take care of all the information and connections in the backend regarding every single learner in the system. By developing this technology we are saving time for all learners to focus on the important things and to automatically connect all the right academic and business organizations, offering corresponding opportunities.

Along with the integration of this decentralized application, Open Source University intends to allow initiating generosity programs for educational purposes. The final solution will also have the opportunity to facilitate internal courses for the business and donations to specific groups of people who cannot afford education and the right to prove themselves in a specific area of knowledge. All criteria of the donations can be set in the smart contract and donors can be certain that the sponsorship has reached its destination, avoiding any third parties and saving a lot of capital for the actual donations. Nowadays, reaching the right target is one of the most valuable assets and by using smart contracts designed for that purpose we are able to create trustworthy relations between business, educators, learners and all kinds of humanitarian activities they might have.

3.3. Gas Consumption

Since the OS.UNIVERSITY project is an Ethereum blockchain-based app, part of the operational issues that were investigated are related to the gas consumption. In order to stimulate all parties to be involved in the learning process, and stimulate them to provide content that corresponds to the market demands, the decision was taken to distribute the gas consumption expenses as follows:

Businesses

- The gas used to create and modify degree blocks in the Ethereum blockchain will be paid by the business (and/or any other organizations that are leveraging the system from a content perspective). Businesses will also cover the gas consumed by Academia (while they are updating courses on the blockchain) + their interest rate (if one is defined).
- If a learner wants to approach a specific business organization, but there is not a full match (i.e. all courses and requirements, defined by the business degree blocks), gas used for the communication will have to be covered by the student. Whenever there is a full match (students that completely cover business-defined learning pathways) and communication is established between the student and the business parties, gas expenses will be covered by the business.

Learners

- Gas expenses, related to profile updates, course progress, and payments for courses will initially be covered by the students. In the future, based on the Generosity concept in OS.UNIVERSITY, after a mutual agreement, businesses will be able to cover the students' expenses partially or entirely.

Academia

- The gas used to synchronize course data on the Ethereum blockchain will initially be paid by the educators (providers of MOOCs and other learning experiences). Whenever Businesses start to combine those courses into learning pathways, i.e. "open source degrees", those expenses will be refunded to the educators. In addition, businesses will pay interest rate according to what is defined by the learning providers, whose offerings are being leveraged.

Section 04. Benefits

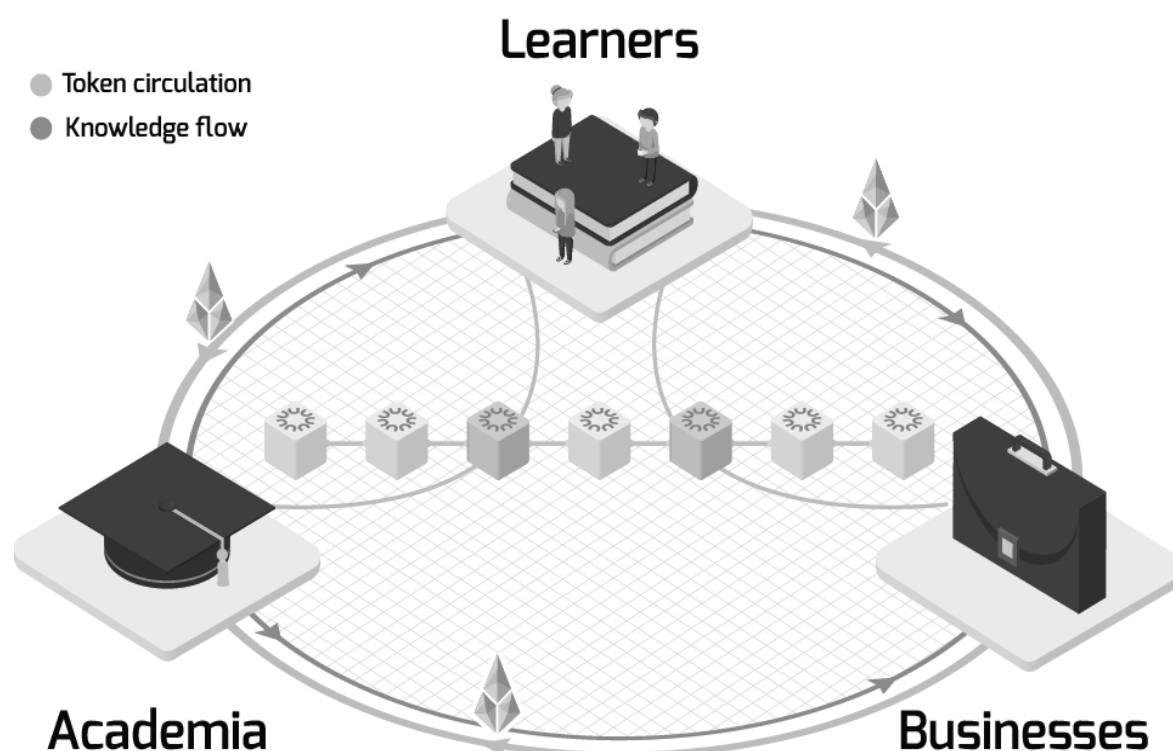
Businesses will benefit from shaping candidate/employee expertise and from directly approaching their learning and development needs in a distributed manner. All “men in the middle” will be excluded from the picture, thus reducing business expenses, reducing lead-time, and increasing expertise accuracy.

Academia will benefit from scaling their audience (hence the economy of scale), gaining competitive advantage through modernization and automation of operations, combined with the customization of the educational experience.

Learners will benefit from receiving higher quality education (adequate to the needs of economy) and from directly approaching employers when it comes to matching the expectations with the individual learning and development profiles - all done directly through the Ethereum blockchain (without a middle-man).

Data about certifications will automatically be submitted on the blockchain, cutting the bureaucracy and allowing all stakeholders to focus on the important aspects of life and business. Any information, related to the parties involved will be stored in an encrypted & secure way and will circulate as visualized below.

Figure 6. Tokens and information flow, incl. opportunities & achievements.



Source: Project archive. (2017)

Section 05. Technology

5.1 Overview

The Open Source University is a distributed education and certification platform, operating on the public Ethereum blockchain. The platform distinguishes three main networks where business, learners and educators will collaborate transparently.

OS.UNI's aim is to bring the education process to its next level. It enables Massive Open Online Courses (MOOCs) and other high-quality learning opportunities, which are distributed over a number of online platforms and providers, to be openly integrated into a common decentralized platform, using smart contracts. This will allow students to benefit locally from the global opportunities in a structured and systemized way.

Businesses will be able to define distributed learning pathways/ open source degrees, truly presenting their demands and publish them on the Ethereum blockchain, allowing to complete those degrees and receive certification that is distributedly preserved and guaranteed. In case of a degree match, students and business will be able to communicate directly.

We call the critical set of smart contracts facilitating the most important interactions between business, students and educators - "OSUni Core". It will be kept small and highly modular to mitigate the possibility and impact of potential bugs in smart contracts.

"OSUni Core" will be made publically available with an open-source license and will go through multiple security audits on every update in order to give confidence to the end users that the highest quality possible is being pursued.

5.2 Architecture

- *EDU(X) Token*: the ERC20 token used to trade courses and degrees;
- *OSUni Business Registry*: handles information about company profiles & their degrees;
- *OSUni Academia Registry*: handles information about educators & their courses/degrees;
- *OSUni Learner Registry*: handles information about students, progress & certification;

- *OSUni Interview*: handles communication between businesses & learners;
- *OSUni Generosity*: handles education related donations for courses and degree.

5.3 Versioning Scheme

The OSUni Core is going to use a semantic versioning model.

Given a version number MAJOR.MINOR.PATCH, increment the:

- MAJOR version when you make incompatible API changes;
- MINOR version when you add functionality in a backwards-compatible manner;
- PATCH version when you make backwards-compatible minor improvements.

Additional labels for the pre-release and the build metadata are available as extensions to the MAJOR.MINOR.PATCH format.

5.4 DAPP & Hyperlog

Detailed data will be kept on the blockchain in a multi-master, append-only database called ‘hyperlog’ based on ‘MerkleDAG’ objects, composed by many DAGNodes that are linked using the Ethereum blockchain technology.

To ensure consistency, the overall result will be verified through the OSU Interview module. Involved parties will be able to register information which will be used during every business - learner “interview” process. The exchange of private data sets peer-to-peer will redefine the Ethereum blockchain network and bring the much-needed privacy for the sensitive information, along with full transparency of the transactions.

Nevertheless, this approach improves scalability, because the ‘hyperlog’ functionality is essentially an equivalent to sharding. (see “Scalability” section for more details on how the data will flow between the parties involved).

Business Profiles

- When it comes to recruitment, businesses will be able to target the right candidates for a specific position by organizing all the learners that are available in the blockchain under unique addresses. ‘OSU Business Registry’ will take care of recording company profiles on the blockchain,

aggregating students by skills and using ‘hyperlog’ (peer-to-peer connection) + ‘node-rsa’ (for generating 512 bit-length keys for the sensitive information) in addition to MapReduce (condensing large volumes of data into useful aggregated results) in order to handle big data smoothly on the client side.

- One of the most valuable benefits is that ‘OSU Business Registry’ saves significant amount of time and money for the business in the process of connecting the right candidates, excluding the third parties.

Learners Profiles

- It will be possible for the students to pay for specific courses or programs/ specializations/ open source degrees (i.e. block of courses) with all conventional currencies including ETH, BTC and LTC.
- Within the structure, information for every learning opportunity will be specified in terms of skills that it supports developing. Incentivization mechanisms (e.g. fee-waivers) will be put in place through smart contracts in order to encourage learners to enroll in learning that is in demand⁴⁴, as well as in learning that is needed to society at large:
 - *Integrative and Applied Learning* - demonstrated through the application of knowledge, skills, and responsibilities to new settings and complex problems;
 - *Intellectual and Practical Skills* - practiced extensively across the curriculum, in the context of progressively more challenging problems, projects, and standards for performance;
 - *Knowledge of Human Cultures and the World* - focused on engagement with big questions, enduring and contemporary;
 - *Personal and Social Responsibility* - anchored through active involvement with diverse communities and real-world challenges.⁴⁵

⁴⁴ According to the work of Hart Research Associates (2013) - “*Priorities for College Learning and Student Success*”, 95% of employers “put a priority on hiring people with the intellectual and interpersonal skills that will help them contribute to innovation in the workplace”. 95% of employers say “a candidate’s demonstrated capacity to think critically, communicate clearly, and solve complex problems is more important than their undergraduate major”. 93% of employers say that they are asking employees to “take on more responsibilities and to use a broader set of skills than in the past”. 91% of employers say that “the challenges their employees face are more complex than they were in the past.”.

⁴⁵ Academic implications & demands, according to the LEAP initiative, AAC&U.

Academia Profiles

- Educators will start to reap the benefits of joining the blockchain the moment the businesses start to add preferable learning experiences, aggregating blockchain data, according to their needs and requirements. When businesses combine specific courses into custom specializations, adapted to their profile, fees that are already set will be paid to the institutions and experts, supplying the content.
- The fee (when such is charged) will be decided upon by the educators and will be publicly distributed over the Ethereum blockchain. Educators will have a rating, recorded on the blockchain, which can be updated from businesses and learners, based on provided content and top talents (formed by specific educators).

5.5 Security

Securing our Token and sensitive information distributed over the blockchain is our highest priority. OS.UNI's team is making three step security audits. First step is detailed internal test for information security vulnerabilities like reentrancy bugs, ponzi schemes, manipulation of smart contract outcome etc. The second step is to test every new version and upgrades of the contracts over test network consulting with private already launched successful ICOs. The third step is vulnerability testing in a sandbox environment organized with the white-hat community members incentivized by a bounty programme.

We know that smart contract developers must be a lot more security-focused than their traditional software counterparts. Over the blockchain the design and programming paradigms evolved exponentially. Unlike traditional software lifecycle, where version upgrades is the norm, smart contracts are immutable once deployed. Smart contract architecture must be highly modular foreseeing future changes.

OS.UNI testers of smart contracts' security understand the new paradigm of distributed trust computing and showing proficiency in frameworks as Open Zeppelin and Oyente. We strongly believe that raising awareness and responsibility on smart contract security are both essential steps in beginning to build a solid defense.

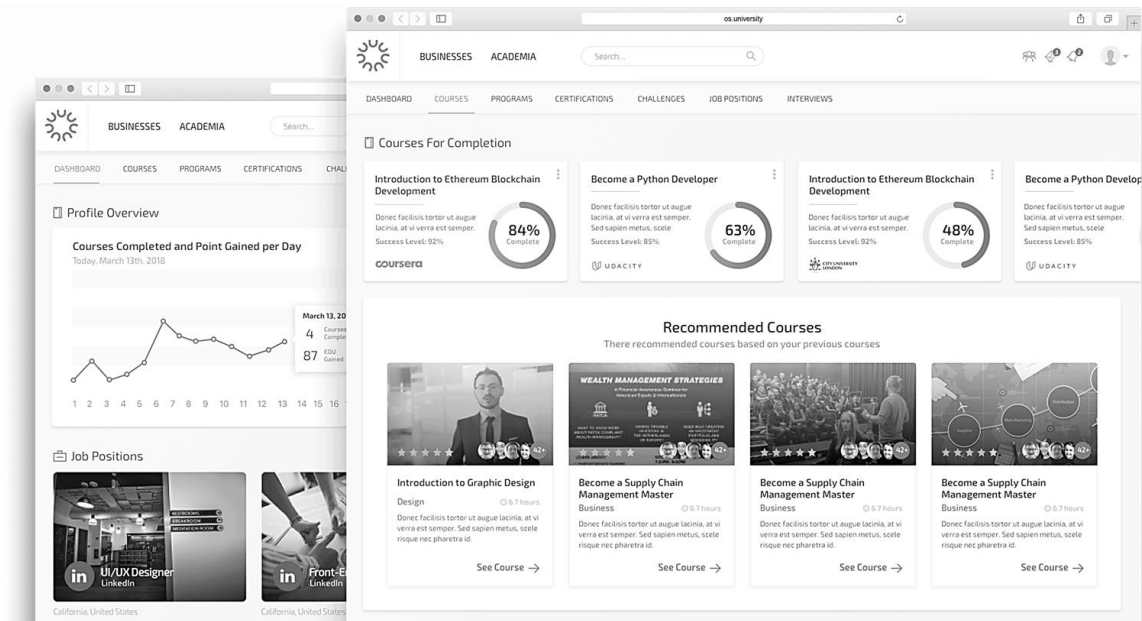
5.6 Scalability

A further perk of keeping data into the blockchain only shared between businesses and learners is that only they get access to the messages handled by OSUni “Interview” module. However, the general public can still see on the blockchain recorded tags and meta-data of all the learning experiences (course, programs, etc.), related to a specific address, but nothing more.⁴⁶

“OSUni” network has several layers: the first one is OSUni exchange, which is built on Ethereum smart contracts, containing a few solutions which allow us to have flexibility by adding a few layers on top of one scalable base.

In short, the technical development team is adding a unique functionality to an already working Ethereum blockchain. By nature, OS.UNIVERSITY extension is using hyperlog and MapReduce, processing and aggregating big data to retrieve the right information to the clients – it is extremely scalable and maintainable by all nodes in the ecosystem.

Image 2. Screenshot of the homepage of the tokenized marketplace, equipped with sophisticated matching algorithms, providing educational & career history, verified by blockchain technology in a transparent and traceable way.



Source: Project archive. (2018)

⁴⁶ Project’s primary purpose is to automate and simplify the processes around a learning experience’s lifecycle. From application and registration to graduation and beyond (when we speak of formal learning in an academic or corporate setting). These details/events are stored in a decentralized secure manner, because broadly speaking, OS.UNIVERSITY includes features considered as part of a traditional enterprise resource planning (ERP) system.

Section 06. Token

Within the Open Source University ecosystem, the token (EDU) will be used to facilitate the connections in the educational system between businesses, learners and educators. Current educational systems are fragmented and isolated from each other. Each educational institution maintains their centralized system and means of tracking student information. This holds true from elementary to secondary, to higher and broader further education (incl. corporate L&D). In today's environment, if a learner changes an institution, learner's data is not managed in a way that allows the data to migrate, or transfer with the learner as the owner of his identity.

With OS.UNIVERSITY, Academia will be able to create courses and programs and upload part of the information, related to those, on the blockchain. Once the student enrolls in a specific course or a learning pathway (provided for free, or with a fee) all the information about the expertise and progress will be saved in the blockchain. That will allow businesses to target the right candidates, keeping in mind that private information about the contact of students will be kept highly secured behind public addresses of transactions, which cannot be traced. Business will also be able to publish courses and open source degree blocks, and refund the educational process for promising candidates/employees partially or entirely. The number of participants in courses will increase exponentially corresponding to the added value of the courses and degrees, which Academia is supplying.

Originally, the ERC20 token standard was available and actively being discussed as an Ethereum Improvement Proposal (EIP). On GitHub, Hudson Jameson of the Ethereum Foundation said, *“To be clear, this is NOT a new version of ERC-20. This PR is simply meant to formally define ERC-20 version1 since there are slight deviations within the community. Once a community consensus on version1 is reached, we will mark this ERC as accepted and it will become official with regards to the EIP repo.”*

The Open Source University token (EDU) is designed according the latest EIPs that has been adopted in the previous hard fork and these planned for immediate adoption expected to be included on the next hard fork.

EDU tokens will be generated during the pre-sale and the actual sale period will depend upon how many are purchased and acquired during that period.

Section 07. Team

- ***Prof. Kevin Dowd – Independent Economics Advisor***

Prof. Kevin Dowd is affiliated with the Cato Institute and is a Senior Fellow at The Cobden Centre, an independent educational charity, founded to undertake research into economic(s) and political science. He is also affiliated with the Institute of Economic Affairs, the Istituto Bruno Leoni, the Independent Institute, and the Pensions Institute. As of this date, he is a Professor of Finance and Economics at Durham University Business School. He has held previous positions with the Ontario Economic Council in Toronto, Sheffield Hallam University, the University of Sheffield, and the University of Nottingham.



Kevin Dowd's main subject of research is private money and free banking — monetary and financial systems that operate without any government intervention and in the absence of any central bank.

He has repeatedly called for the abolition of central banks and an end to state intervention in the financial system.

He advocates competitive monetary systems. His work, "New Private Monies—a Bit-Part Player?", is supportive of private gold money systems such as the Liberty Dollar and e-gold, and expresses measured support for Bitcoin. Dowd is a supporter of commodity-based monetary systems such as the gold standard and is a critic of fiat-based money issued by a central bank.

- ***Prof. Sergey Ignatov - Senior Academia Advisor***

Prof. Sergey Ignatov is a Bulgarian historian-Egyptologist and politician. From 19 November 2009 to 6 February 2013, he was a Minister of Education, Youth and Science in the Bulgarian government, recognized as a public policy innovator and an open-minded academician.



Prof. Sergey Ignatov is a Member of "Friends of Europe", member of the Board of Trustees of the South-East European Research Center (SEERC), member of the Board of Trustees of New Bulgarian University (NBU) and former Rector of NBU.

Prof. Ignatov is founder and head of the Bulgarian Institute of Egyptology.

As of March 2018, he is also a head of a renowned Italian higher education institution, specialized in the field of humanitarian studies.

▪ ***Detelina Smilkova – Senior Academia Advisor***

Detelina Smilkova is Vice President of the University of Finance, Business and Entrepreneurship (VUZF) - the first specialized higher education institution in Bulgaria in the field of finance, insurance, business, management and marketing. In the period 2005-2009 she is an advisor to the Minister of Economy and Energy and since 2007 is Chairwoman of the Kapman Energy Green Fund.



Detelina Smilkova is President of "Business Lady Club" Bulgaria and is the winner of the 2012 "Business Review" magazine award for contribution in the development of education in Bulgaria.

In 2016 she was re-elected Chairwoman of the Managing Board of the Bulgarian Association for Management of People.

▪ ***Prof. Ognyan Andreev - Senior Research Advisor***

As of 2011, Prof. Ognyan Andreev is Head of the Department of Economics, Industrial Engineering and Management at the Faculty of Economics, Technical University of Sofia. Author and co-author of more than 80 scientific papers and reports, 6 textbooks and teaching materials, 3 monographs in the area of project management. He has been part of more than 15 scientific and applied research projects, of which a project manager in 7, including 2 TEMPUS projects and 2 British know-how fund projects on academic education and corporate L&D in the field of management. Prof. Andreev led a World Bank Project for Improving the Quality of Education and Management of Higher Education under the name of "Improving the Quality of Teaching, Learning and Management of Academic Institutions". He has specialized in England, Germany, Denmark, France, Italy, Belgium and the United States in the field of operations management, project management, information systems management, innovation and entrepreneurship.

▪ ***Aly Madhavji - Senior Strategy Advisor***

Aly Madhavji is the Founder and Former CEO of Global DCX, an innovative technology company launching secure digital currency exchanges across the globe starting in India. He is an internationally acclaimed author, publishing three books, including the award-winning book titled, "Your Guide to Succeed in University", as part of the Succeed Series.



Aly served in several advisory roles including as a Governor of the University of Toronto where he was a member of the Executive Committee of the university.

He has lived and worked across 4 continents (North/South America, Europe, and Asia) with PwC, PayPal, Microsoft, Bloomberg, and INSEAD.

He also holds the Chartered Professional Accountant, Chartered Accountant, Certified Management Accountant, and Chartered Investment Manager designations. Aly is a Schwarzman Scholar and holds a Master's in Business Administration from INSEAD (Singapore and France) and a Bachelor of Commerce with Distinction from the University of Toronto.

▪ ***Gordon Kerr – Independent Investment Advisor***

Gordon Kerr is founder and CEO of Cobden Partners, London based investment consultancy. From 1983 Gordon Kerr worked as a capital markets investment banker for Bank of America, Merrill Lynch, Nomura Securities, Abbey National (now Banco Santander), and General Re Financial Products (a subsidiary of Berkshire Hathaway). In 2003 Kerr and his Abbey colleague established their own firm ("NK") as a debt capital markets consultancy. NK clients included British merchant banks such as Close Brothers, life insurance companies and fund managers. NK also advised open-ended investment funds on net asset value calculations and passive (risk neutralizing) currency risk management.

In 2011 Kerr established "Cobden Partners" as a financial consultancy brand, specializing in both banking crisis advice, and investment opportunities arising from the re-alignment of financial markets resulting from the Great Financial Crisis (GFC). Cobden Partners have completed a number of private assignments for government and private entities in Europe.



In 2012 Gordon was invited to be a Senior Fellow at the Institute for Research in Economics and Fiscal Issues, Luxembourg (IREF).

Kerr is the lead author of IREF's monthly Newsletter, which reports developments in central banking policy and likely impact on financial markets. The Newsletter is distributed to 500+ European institutions, 'think-tanks' and universities.

In the UK, his input to the government helped shape the tax rules regarding property derivatives. Since the Financial Crisis of 2008 Kerr has been asked for input on derivatives, accounting and general banking ‘instability issues’ by UK institutions such as Her Majesty’s Treasury, the Bank of England, and the main financial affairs scrutiny committee of the Parliament – the Treasury Select Committee.

- ***Hristian Daskalov - Project Lead***

Author of the book “Stakeholder Management in Higher Education, Research & Innovation”. Former secretary general of the national students’ assembly in Bulgaria. PhD student at Sofia, Brno, and Riga Technical Universities in the area of open source project management. Policy expert at the Brain Workshop Institute with background in the area of innovation, incl. as part of the expert body behind the national investment program on science and education, and as a consultant to the Ministry of Economy on the “Smart Specialization Strategy” (S3).

- ***Jordan Jambazov - Technology Lead***

Senior Software developer with 10+ years of experience. Co-founder of software consulting company IO Era. Open Source software advocate. Jordan has experience in organizing and leading academic courses and broader learning & development initiatives, such as hackathons, in an open and collaborative manner, leveraging community engagement and co-creation tools and techniques.

- ***Dobromir Kovachev - Blockchain Developer***

More than 10 years experience in software development field combined with successfully finished software solutions with National significance for customers like “Kozloduy” NPP, “Belene” NPP and NABUCCO pipeline. Deep understanding of blockchain and real live solutions. Passionate visionary and lifelong learner, with years of experience as developer and coach of cross functional teams.

- ***Momchil Jambazov - Creative Technologist***

Digital designer, web developer and problem solver with over 8 years of experience in building websites, e-commerce and other digital experiences. Momchil is passionate about new technologies, such as blockchain cryptocurrencies, and strives to build a better and more beautiful web.

His other passion is related to open education, incl. Massive Open Online Courses (MOOCs) as a mean to open-up academic learning towards new audiences. His entrepreneurial experience includes co-founding three successful companies in the field of web and application development - Emphybit, Code Ideo and IO Era, working with clients from Europe to Canada and the United States.

- ***Vladimir Tasev - Blockchain Developer (up to March 2018)***

Vladimir has deep knowledge as a software engineer with rich experience in .NET framework, SQL Server, web development and Solidity. His professional experience begins as Software developer at DeltaStock LTD - the leading company for providing integrated online trading services to clients from all segments in Bulgaria. He is currently involved in several projects in the digital world. He is a co-founder of Cerve.me and founder of the Softador.com. All of this is supported by a degree of Business Informatics that provided him with the knowledge in developing IT strategies and project management that involves establishing and pursuing the project goals.

- ***Petar Angelov – Software Developer (up to March 2018)***

Petar has a solid experience in the IT field with more than 6 years working as a Programmer Analyst. Additionally, he has a profound knowledge in .Net framework and SQL Server technologies. What adds up to his professional experience is the development of trading forex software. Along with his role as a developer, he is also engaged in business analyzing. Since the beginning of 2016 Petar has been a huge blockchain fan and Ethereum enthusiast. His knowledge and experience is also backed up by a Masters degree in IT.

- ***Teodora Alexieva - Marketing Lead***

Teodora has more than 5 years of experience in online marketing, and advertising, she is a bitcoin enthusiast as well. She has ran and managed digital marketing projects in the online service industry, and has been a part of the team of a major European co-working space as an event manager. Teodora has experience in organizing and managing community events and startup & entrepreneurial initiatives, such as pitch sessions, skill sharing events and small conferences. This all resulted in her last occupation as a Regional Manager of an international trading company, working with Hong Kong/China region. She is backed up by a degree of Journalism and Mass Communication.

- ***Stephan De Haes – Advisor***

Stephan is Chief Operations Officer at Krypt.ly, a FinTech startup launching their unique Interactive Coin Offering next year. He takes the lead in all social media and ICO-related subjects and overlooks the general operations of the company. Their goal is 'Redefining value' and making cryptocurrency available and acceptable for everybody.

He is also Founder of the Krypt.onomy Communities with more than 1.500 members which introduce cryptocurrency to beginners and provide news, articles, technical analyses and general advice.

Stephan firmly believes that Blockchain will change the world and he wants to play his part in making Cryptocurrencies mainstream. In a short period, he has made a large amount of connections by working together with big companies in the ICO- and crypto-space.

- ***Dr. Angel Georgiev - Corporate Advisor***

Dr. Angel Georgiev is a co-founder and a Chief HR Officer of one of the fastest growing online retailers in South East Europe - "MyMall", backed by Endeavor, global high-impact entrepreneurship movement.



Dr. Georgiev is an active educational reform advocate, having served as a member of the General Assembly of the European Students Union (ESU), and as a Chairman of the National Assembly of the Students Unions (NASU) in Bulgaria.

He holds a PhD degree in financial management.

He is currently working on implementing innovations in the HR business practices, incl. corporate learning and development, in order to enable the growth of successful enterprises.

▪ ***Yana Vangelova - Community Advisor***

Yana Vangelova is a chairperson of the National Students Union of Bulgaria (NASC) and a member of the general assembly of the European Students' Union (ESU). Representing a community of 250,000 bachelor, master, and doctoral students in Bulgaria, she is part of the Open Source University research team as of the start of the project that intends to modernize the higher education and career development processes on a global stage.

She is a PhD Candidate at Burgas University, and a successful entrepreneur in the field of marketing.

▪ ***Kuzman Iliev - Research Advisor***

Kuzman Iliev is a co-founder of the "Brain Workshop Institute", Bulgaria-based research center with a strategic aim is to become a leading analytical trust in South East Europe, having organized some of the biggest free market conferences in the region. Apart from Kuzman's role as a TV host on "Bloomberg" & "Bulgaria On Air", he works on his doctoral thesis in the field of banking and financial economics. He is Master of Public Management from IEP Toulouse. His analytic interests are in the area of economics, money and credit theory, monetary policy, the economic cycle, financial and economic history, the history of economic thought, Austrian economic theory and political philosophy.



Kuzman is an active advocate in the field of education. In 2010 Kuzman was announced as New Bulgarian University's "Student of the Year". He has co-founded and led two of the most active and successful clubs within the university - "Economy & Finance" and "Francophony".

He is a holder of the prestigious Charles Mosser Award.

Since 2010, Kuzman has established himself as a leading news media analyst. Since November 2011, he co-hosts "Boom and Bust" - renowned TV broadcast on economy and finance, aired on "Bloomberg TV Bulgaria".

▪ ***Vladimir Sirkarov - Research Advisor***

Vladimir Sirkarov is a TV host / author at Bloomberg Bulgaria, and TV Host at Bulgaria ON AIR. He is also an economic researcher at the Brain Workshop Institute (BWI), founding member, and first Chairman of the Board of the Institute⁴⁷. Vladimir is a passionate free-market and financial industry expert, working on his PhD research on the subject of "Austrian theory of money and credit and the reform of the monetary system".



Vladimir's interests are focused in the areas of monetary policy, "Austrian" economic school, macroeconomics, capital and currency trading, investment strategies, and cryptocurrencies.

He has led corporate Bitcoin and Blockchain-oriented workshops for companies such as HP and academic ones as a founder of the "Economy & Finance" club, New Bulgarian University.

▪ ***Evelina Prodanova - Organizational Advisor***

Evelina Prodanova is a member of the Association of Bulgarian Leaders and Entrepreneurs and a former Executive Board member. She is also a member of Bulgarian Centre of Women in Technology (BCWT), a co-founder of the Brain Workshop Institute in Sofia, and is affiliated with USC and Marshall Business School through the Fulbright foundation. Evelina is currently based in Los Angeles, having been awarded a Fulbright scholarship, working as a founding researcher at StartupCulture.guide.

⁴⁷ Brain Workshop Institute is among the first organizations in Bulgaria to introduce educational workshops around crypto economy and blockchain technologies, especially in corporate setting where the technology has huge potential in the form of private blockchain implementations.

**EVELINA PRODANOVA**

Evelina has gone through a Program in Entrepreneurship in Babson College and is currently working on an R&D concept to help new ventures develop a sustainable organizational culture that leads to business effectiveness.

She has more than 4 500 presentations and has worked with over 900 customers at Southwestern Advantage.

Evelina holds a Master's degree in Organizational Behavior and Consulting of Organizations and is currently a PhD Candidate at Sofia University, combining the two fields that she is passionate about - organizational psychology and entrepreneurship.

▪ ***Victor Zhang - Academia Advisor***

Victor Zhang is founder of the first private higher education institution in Mandalay, Myanmar - Mandalay International University, partnering with Thailand-based Shinawatra University in order to provide affordable high quality learning and development opportunities in a rapidly growing market. He is our point of contact with South-East Asia booming academic and business communities. Mr. Zhang serves on the board of a family-owned company, one of Myanmar's oldest, biggest, and most respected tea producers. He is also a doctoral candidate at the Meijo University, Japan. His research on the problems of academic reform and university-business cooperation has been recognized by the global Society of Open Innovation, based in South Korea, which publishes the open access "Journal of Open Innovation: Technology, Market, and Complexity" in partnership with "Springer".

▪ ***Kalin Tsekov - Technology Advisor***

Kalin Tsekov is founder Navigato - technology startup, providing electric vehicle solutions. He is also a CEO at iOSBuild software consultancy. He is a man of many talents - AI, big data, and blockchain evangelist above all.

Apart from being an active startup community enthusiast, he is a serial entrepreneur with proven track-record, and an innovator in the electric vehicle decentralized revolution, mobile apps development, data analysis platforms, high-performance server applications (IPTV / OTT platforms), AI/neural networks, betting & online casino software, payment services, microcontrollers, automotive. Kalin is known as an Apple evangelist in addition to his business developer, decision maker, and AI / Machine Learning passions.

- ***Miglen Evlogiev - Technology Advisor***

Miglen Evlogiev is our point of contact with Ireland IT and business communities, being based in Dublin. Miglen works for AWS, world's largest cloud services provider, having specialized in DevOps. His 10+ years experience in the technology sector include roles as a co-founder and CTO of a digital marketing consultancy and development company, and as a Technology Team Lead in Hewlett Packard Enterprise, acting as a subject matter expert and stakeholder coordinator on existing and new businesses. Certified professional with more than 40 professional development courses, certifications, honors, and awards behind his back. Open source, books and extreme sports enthusiast.

- ***Denitsa Simeonova - Community Advisor***

Denitsa is the Executive Director of the Association of Bulgarian Leaders and Entrepreneurs - an active entrepreneurial community of over 200 young people. She is also a Project leader of Central European Startup Awards 2017, part of Global Startup Awards, which is a series of events in the CEE countries, to recognize and celebrate the entrepreneurial spirit and startup ecosystems of this diverse region.

She is a graduate of the Summer Entrepreneurship Programme, administered by the Institute of International Education and Babson College in the United States, as well as a graduate of the Economic Development Certificate Program of the Centre for Economic Strategy and Competitiveness, Sofia University and Michael Porter's Institute for Strategy and Competitiveness at Harvard Business School. Her professional experience includes working as a business reporter for "Capital Daily" and "Capital". Previously she served as an expert "General investment services" at the Invest Bulgaria Agency (IBA) and Project Management intern at GfK NoP, London, United Kingdom.



Denitsa is a member and former Grants Committee leader at the European Students of Industrial Engineering and Management (ESTIEM) network.

Denitsa holds a Bachelor's degree in Industrial Engineering and a Master's degree in e-Management from the Technical University of Sofia.

▪ ***Iva Tsolova - Community Advisor***

Iva Tsolova is one of the two Bulgarian youth delegates at the United Nations, having been nominated and chosen to serve for a 18-month period in 2016. As part of her duties, Iva advocates for the interests of young people when it comes to the development of policies on national and international level, incl. in the field of education and career development. Iva is a part of the "Listen to It" Foundation, where she works to ensure equal access for deaf people in Bulgaria.



Iva is a socially-oriented change-maker, having trained displaced migrants in a refugee camp, having served as a Deputy Chairman of AIESEC, and being an active member of the Association of Bulgarian Leaders and Entrepreneurs (ABLE).

She is the founder of "Berlle Creative Studio" and co-founder of the social advertising agency "LEMUR".

She has a degree in "European Sciences" from the University of National and World Economy and has participated in the Entrepreneurial Development Program of the "America for Bulgaria" Foundation in the United States. She holds the 2016 JCI award for most prominent young person (TOYP) in the "Humanitarian and Volunteer Leadership" category.

- ***Jeroen van Hertum - Business Advisor***

Jeroen van Hertum has 18+ years of experience working in the IT sector, combined with 13+ years as entrepreneur. Currently he is Marketing Director at Strypes, dutch-owned software development company based in Sofia, employing 170+ people. He has organized some of the best software development, agile and stakeholder management events in Sofia. Jeroen has established himself as a leading player in the technological community and is providing valuable guidelines to the Open Source University project in regard to sales, operations and interaction with businesses.

- ***Dr. Miroslav Pantaleev - Academia Advisor***

Dr. Miroslav Pantaleev is Head of Electronics Lab at Onsala Space Observatory, Chalmers University of Technology in Sweden. He has experience in line management of cross-functional teams, containing engineers, technicians and scientists. Mr. Pantaleev is also a co-founder of Gapwaves AB, leading company in commercialization of the Gapwaves technology and antenna systems. Project Manager for SKA-DC Band 1 Work Package and WBSPP-AIP Consortium. Duties include internal resource planning, WP definition for industrial partners, writing of progress and review reports, preparation and participation in telecons progress and review meetings. Working also with the design of the signal chain and feed optimization, design of hybrid and filters. Miroslav Pantaleev is providing valuable feedback to the Open Source University project regarding interaction with academia.

- ***Justin Looney – Academia Ambassador***

Adjunct professor Justin Looney is a solutions-oriented IT Professional with over 20 years of diverse experience in managing, developing, and deploying technology solutions and teams for civilian and federal customers. Currently managing higher education projects for Eastern Florida State College in the Planning and Assessment group, as well as teaching Management courses.

Expert in student records management, higher education advising, and admissions processes. Previously served the U.S. Environmental Protection Agency as an Information Technology Specialist, managing Network and Security Operations for the Agency National Computer Centers hosting, storage, firewalls, and local and wide area networks. US Army Reserves Telecom Operations Chief Instructor (Retired). Former IBM and Emulex Systems and Network lead engineer with demonstrated ability to manage teams and projects under pressured fast-paced, time-sensitive environments.

- ***Borislav Iliev – Crypto Advisor***

Bobby is a technology enthusiast, who has been observing cryptocurrency markets and blockchain technologies since 2013. Currently works as Project and Media manager in marketing and consulting company for crypto projects, ICOs, startups, etc. Furthermore, he is taking roles as an advisor and analytic consultant in different projects, related to cryptomarkets and ICOs. Holds Bachelor's degree in Marketing and Master's degree in Financial management.



Borislav was international officer for the National Assembly of Student Councils of Republic of Bulgaria, also has more than 10 years' volunteer experience in public sector, NGOs and students' movements. He applies economic expertise, teaching skills and technical knowledge to promote blockchain and P2P technologies as part of society's future.

- ***Mariya Georgieva – Ambassadors' Program Lead***

Mariya Georgieva is an entrepreneur with rich experiences in many different spheres. Following her education in Diplomacy and International relations, she became a political campaign manager and organizer and expanded her international experience by living and working in UK, USA and Iceland.

In order to utilize her creative skills, she also spent 3 years working as a screenplay writer for one of the biggest TV production companies in Bulgaria.



Mariya is starting her PhD, researching the development of nation-states and the role of the blockchain in the Cyber Age.

Open Source University project has significant meaning for her as she is convinced that blockchain-enabled education can make a remarkable difference in our lives.

- **Vsevolod Okhrimenko – Software Developer**

Vsevolod has more than 3 years of experience as a front-end developer, also quite enthusiastic about cryptocurrencies the last 2 years. As a developer he has knowledge of HTML, CSS, jQuery, Swift, C++ and others. Easy-learner with strong technical background helping the team with the daily website updates as well as completing many tasks related to the Front-end of Alpha of the Core.

He has gained a lot of knowledge of marketing and cryptocurrencies and this all resulted in his occupation as a Community Manager of OS University Russian community. Apart from all this all he is part of a company organizing events for Erasmus students in Bulgaria.

- **Margarita Taskova – Graphic Designer**

Margarita is an avid designer and currently contributes with graphic and web design. Aside from that she has years of experience as a freelance artist and strives to incorporate her artistic vision into her professional life. She is passionate about cryptocurrencies and blockchain and is a lifelong learner, who is ambitious to help other learners. She also holds a Philology BA degree and is in charge of the Greek and French community.

- **Alex Bozhinov – Crypto Ambassador**

Alex is passionate about growing businesses the non-standard way. He is an advocate of zero-cost marketing and growthacking. Alex previously worked as a Business Development Manager at Google in Dublin where he helped hundreds of businesses be successful online. He also has 2 startups behind his back and now is working on the next one - Crowdholding.

- **A V Ravi – Corporate Ambassador**

Mr. A V Ravi is OS.UNIVERSITY project ambassador in Eastern & North Eastern India. With more than 18 years of corporate experience behind his back, he is now helping graduates find employment through his “Pathfinder” project and his engagement with the team of world’s L&D ledger on the blockchain.

- **Milena Ribarova – Corporate Ambassador**

Ambassador to the OS.UNIVERSITY project, has 20 years in the Finance and Banking area. She is passionate about bringing a bright future for the Education and Mastery of the Generations. She is optimistic and open and loves to work with people and to contribute to their growth. Her moto is “If there is no road, build one!”

- **Camila Claudino –Community Ambassador**

Students’ Community Ambassador at UNIFESP – São Paulo.

- **You, the Reader? ⁴⁸**

Are you interested in becoming the next ambassador of OS.UNIVERSITY in your university, industry, country? Do you believe that together we can open-up and modernize education with the help of the distributed ledger, creating new opportunities for all, establishing consensus⁴⁹ among learners, educators, and businesses? We need open education and open science evangelists throughout the world - because knowledge knows no boundaries!

⁴⁸ As of the publication of the book, the team is in contact with at least 15 other experts, educational and corporate leaders from around the world. For latest info on advisors and ambassadors, check: www.os.university/team.

⁴⁹ In distributed computing the consensus problem requires agreement among a number of processes for a single data value. Some of the processes may fail or be unreliable in other ways, so consensus protocols must be fault tolerant. According to “Blockchain Hub”, the processes must somehow put forth their candidate values, communicate with one another, and agree on a single consensus value. As an example, the bitcoin blockchain uses electricity to ensure the security of the system. It creates an economic system where you can only participate by incurring costs, i.e. Proof of work (POW). You do that for the possibility of a reward – a bitcoin. This simple game theoretical equilibrium is the core of the bitcoin consensus algorithm (though alternative algorithms exist).

Section 08. Roadmap

- **2015** - The OSUni proof-of-concept phase was initiated, along with corporate partners from the Bulgarian industry and software development sectors, resulting in early versions of the system's architecture and design. The OSUni research project initiated at the Faculty of Management within the Technical University of Sofia, resulting in scientific publications on the subject, published in Bulgaria, Latvia, and the Czech Republic.
- **2016** - OSUni was announced among the top 10 social innovation ideas globally, in competition with 400 technology concepts and 130+ project proposals as part of the Living Progress Challenge of Hewlett Packard Enterprise. OSUni receives positive reviews and engages itself in expanding its partnership network under programs for supporting young entrepreneurs, led by the Ministry of Economy and the Open Society Institute, as well as through the Sofia Business School.
- **2017** - OSUni was announced as a 2017 “YouthSpeak” forum winner in Latvia, based on a scaled-down prototype version, resulting in a 2-month distributed learning program implementation project at a community center in Sao Paulo, Brazil. The OSUni development phase reaches an important milestone, given the expansion of the team with professionals from a leading software consultancy and experts, specializing in blockchain-based applications, leading the way to our initial coin offering (ICO).
- **2018** - EDU tokens will be registered for trading at various cryptocurrency exchanges (this might happen under the EDU-X tag or similar in order to differentiate the project from competitors). Universities, online platforms, and other L&D providers, will be onboarded, along with their educational offerings. The beta version of OSUni platform is to be released in Q2 2018.⁵⁰
- **2019** - A global educational marketplace will function on top of the distributed database, i.e. the Ethereum blockchain. Academia, learners, and businesses will have the chance to see the benefits of implementing the platform in practice – from learning, credentials verification, and career development perspective.

⁵⁰ Upon the publication of the roadmap, but prior to the alpha release, OS.UNIVERSITY received an important recognition – the project was nominated among the best IT projects of 2017 by the Bulgarian Association for Information Technology (BAIT). The prestigious event took place in February 2018 under the official calendar of the Bulgarian Presidency of the EU.

Section 09. Crowdsale

The tokensale, intended to distribute the EDU tokens throughout the global OS.UNIVERSITY community, is being held through a smart contract. Its address was published on the OS.UNIVERSITY website on the 20th of November 2017. The first funding round (the pre-sale) ended successfully on the 31st of December.

The EDU tokens are the fuel of the platform. They are being sold in order to accelerate the development of the OS.UNIVERSITY platform, i.e. to raise enough capital in order to realize the full potential of the idea and turn the project into a leading system, facilitating the connection between the educational and the business worlds globally.

While this effort leverages upon the knowledge and motivation of each member of the OS.UNIVERSITY team, the early investors are ones to enable the team to fulfil its mission sooner and more efficiently. In return, team's commitment to investors is in the form of different mechanisms for appreciation of the value of their investment, such as implementing a scheme to 'burn' significant percentage of the fees collected through the platform in order to ensure sustainable growth.

The pre-sale's goal was to raise ~3750 ETH for funding the platform's Alpha release and initial business development. The Alpha release, the main tokensale and the EDU token exchange listing are all to take place in first half of 2018. But prior to that, an appraisal had to be made in order to set the original valuation.

The appraisal of the OS.UNIVERSITY utility token was commissioned by the "OS.UNIVERSITY" team and run independently in an effort to price an asset that belongs to an emerging asset class to which standard valuation methods don't apply. That is the class of cryptocurrencies.⁵¹ While this appraisal does not intend to offer investment advice of any kind, it is important to share the details, regarding the results of the EDU utility token analysis, covering token's value proposition, the market opportunity & the existing alternatives, so that the full extends of the blockchain-based project are taken into consideration.

When it comes to crypto-asset valuation and crowdsale campaigns, they are based on industry-standard concepts, such as total addressable market (TAM), penetration of that market, velocity.

⁵¹ Read more about crypto-valuations at <http://research.ark-invest.com/bitcoin-asset-class>.

As highlighted previously and further repeated ahead in the document, the EDU token is considered a utility token, meaning that it gives the owner access to a specific protocol / network⁵², thus it is not to be classified as a financial security (to which other valuation and regulation procedures apply) – a conclusion, confirmed by the outcomes of the preliminary appraisal and SEC’s Howey Test.⁵³

Based on the outlined areas of assessment, and taking into consideration the ETH market price as of October 15th 2017⁵⁴, a price range of 700 to 1400 EDU tokens per ETH was recommended for a pool of 34.8 million tokens that are to be sold during the different phases of the crowdsale campaign⁵⁵.

Apart from the above-mentioned applied valuation concepts, the price range reflects multiple environmental factors, such as the strong volatility of crypto-assets in general – especially in regards to the wide time frame of the campaign (starting with a pre-sale in Nov. 2017 and ending with a crowdsale in Q2 2018).

As far as the market opportunity is concerned, the findings from the recent research report of European Commission’s “Joint Research Center” were primarily analyzed. The report concludes that in an educational context, the blockchain as a technology has the potential to “*disrupt existing institutional norms, information systems and empower learners*”.⁵⁶

The appraisal, completed on Oct. 16th 2017, concluded that there are no competitive projects to claim the end-to-end multi-faceted value proposition of OS.UNIVERSITY and its EDU token, while a range of potential partners are identified along the value chain and competitors should be expected in the future with the successful implementation of the venture.⁵⁷

⁵² Find out more about utility tokens at <http://www.nasdaq.com/article/what-is-an-ico-cm830484>.

⁵³ Find out more about SEC’s assessment framework at <https://os.university/static/SEC-Howey-Test.pdf>.

⁵⁴ Historical data available at <https://coinmarketcap.com/currencies/ethereum/>.

⁵⁵ The amount of tokens to be generated and put in circulation reflects the big number of use cases, which will be rolled out upon the initial launch (that is focused around 3 main smart contracts). Some of the broader use cases to be covered include: - handling admission processes; - document grading, test scores, and other assessments; - managing other various student attributes and conditions; - executing student accounting and financial aid; - managing housing, dorms, and facilities attributes; - individual education plan services; - career services management, internships, traineeships, apprenticeships; - fees management; - faculty and staff payroll processing; - regulatory reporting and reports for accrediting bodies.

⁵⁶ The entire report is available at <https://ec.europa.eu/jrc/en/publication/eur-scientific-and-technical-research-reports/blockchain-education>.

⁵⁷ A deeper market analysis concluded that neither the value proposition, nor the software architecture of OS.UNIVERSITY are a subject of replication. The system is the only within the industry vertical to incorporate IPFS as a hypermedia distribution protocol, which enables the creation of completely distributed applications.

Section 10. Traction

As part of our sustainability and traction building strategy, the team is going to approach and build partnerships with businesses, academic institutions and student organizations.

Some of the potential partners that are recognized on the ed.tech vertical and are mentioned within the white paper on a number of occasions are Coursera, EdX, Udemy, Future Learn, Open 2 Study and others, listed in the document “*Research on the existing EdTech business landscape*”, accompanying project’s documentation.

As business partners, OS.UNIVERSITY intends to approach and work with all the “Fortune 500” technological companies - a dedicated team is to be working with them, so that a flawless adoption of the technology can occur.

In order to build traction among students, the team is approaching directly international, national and local (technology-oriented) representative student bodies, including ESU (European Students Union); ESTIEM (European Students of Industrial Engineering & Management); BEST (Board of European Students of Technology); NASC (National Association of the Students Councils).

Image 3. High school directors’ networking event, moderated by OSUni project lead.



Source: Project archive. (2015)

Finally yet importantly, OS.UNIVERSITY is not alone in its quest. As outlined on a number of occasions throughout the white paper, universities such as Open University⁵⁸, University of Nicosia⁵⁹, MIT⁶⁰, etc., along with corporations, such as Sony, are all working on pilot projects.

The recent report by the Joint Research Center (JRC) of the European Commission that was analyzed earlier on concludes that blockchain applications for education are still in their infancy. It describes case studies of implementations from various European and non-European players, but each of these implementations is in a piloting phase⁶¹. However, even from these early pilots, it is possible to suggest that blockchain has the potential to disrupt the market in student information systems, by loosening the control current players have over this market in line with open education's sharing and transparency principles.

All of the above mentioned are invaluable future partners to OS.UNIVERSITY given its multi-chain character providing the opportunity to integrate with other private and public projects for the advancement of the common cause, which is well summarized by Prof. John Domingue, Director of the Open University's Knowledge Media Institute.

- *"We envision a world in which the awarding and validation of qualifications no longer occur exclusively under the management of an education institution or an employer and individual students, teachers, and peers take more ownership of the learning experience and its outcomes without compromising on safety, security, and accessibility"*

⁵⁸ According to OU's Knowledge Media Institute *"the blockchain technologies may hold an answer to collating the outcomes of the new distributed learning reality"* and they intent to explore the possibilities that this infrastructure could provide.

⁵⁹ The University of Nicosia has been issuing academic certificates whose authenticity can be verified through the Bitcoin blockchain since 2014. These certificates are being issued to students who successfully completed or participated in DFIN-511 Introduction to Digital Currency, which is the first university course offered on the topic of cryptocurrency.

⁶⁰ By 2015, Philipp Schmidt, the director of learning innovation at the MIT Media Lab, had begun issuing internal, non-academic digital certificates to his team. Schmidt, according to his words, had realized that, despite the rise of decentralized, informal online learning opportunities, there was no digital way to track and manage these accomplishments. He says he became interested in finding a *"more modular credentialing environment, where you would get some kind of recognition for lots of things you did throughout your life."*

⁶¹ The use-cases, which these pilots cover include: Single institution for authentication of certificates; Groups of institutions for shared repositories of certification and achievement (some universities have grouped together in the US already); National blockchain database of all certificates; Global assessment; Blockchain and badges – open badges to evidence credentials and safe storage; Blockchain and MOOCs – more reliable certification of MOOCs; Continuing Professional Development (CPD) and other forms of formal and informal work-based learning are diverse, and poorly tracked; Corporate learning; Apprenticeships; Bodies of knowledge.

Section 11. Legal

The team have invested in seeking out legal and compliance expertise to ensure that EDU crowdsale meets all current regulatory rules of the Initial Coin Offering at the ICO-stage. The same goes for the operation of the system itself, e.g. in relation to regulations such as GDPR⁶².

According to the professional opinion of its legal advisors, based on the Howey Test, the EDU tokens should not be deemed as security tokens and do not need to be registered as security.

OS.UNIVERSITY focuses on the legislative regulation of the ICO, digital tokens and operations with cryptocurrencies to provide its users and contributors safe and reliable solutions for crowdfunding 2.0.

In accordance with the laws and with respect to our contributors the team adopted a “know your customer” procedure (KYC). This procedure was in place for all contributors as part of the pre-sale in Dec. 2017. The KYC procedure is based on an already proven solution, provided by Parity Technologies Ltd., called PICOPS.⁶³ The PICOPS solution was integrated into the tokensale webpage, according to described instructions by Parity Technologies Ltd.⁶⁴

According to the process, when the contributors pass all the legal procedures implemented into PICOPS by Parity Technologies Ltd., before contributing they have to fill in their Surname, Given name, Country, email and an already verified ETH Wallet on the platform (<https://os.university>).

Apart from this, all contributors have to read and agree with the technical white paper, the “Terms and Conditions”, and the “Privacy Policy” documents. Most importantly, all contributors need to confirm that they are not U.S. citizens, as token-based crowdfunding restrictions apply to U.S. citizens.

The whitelisting process includes all the details mentioned above.

⁶² The way The General Data Protection Regulation, or GDPR in short, is formulated, means that we cannot store data directly on a blockchain since in GDPR terms ‘it is not erasable’. This prohibits blockchain innovators from using this technology to its full potential, so they need to rely on ‘older’ systems for storing data which simply cannot guarantee the same benefits as most blockchain technologies. And here is where OS.UNIVERSITY innovates - it provides the stakeholders with the opportunity (and responsibility) to personally secure their data.

⁶³ More information available at <https://picops.parity.io/#/>.

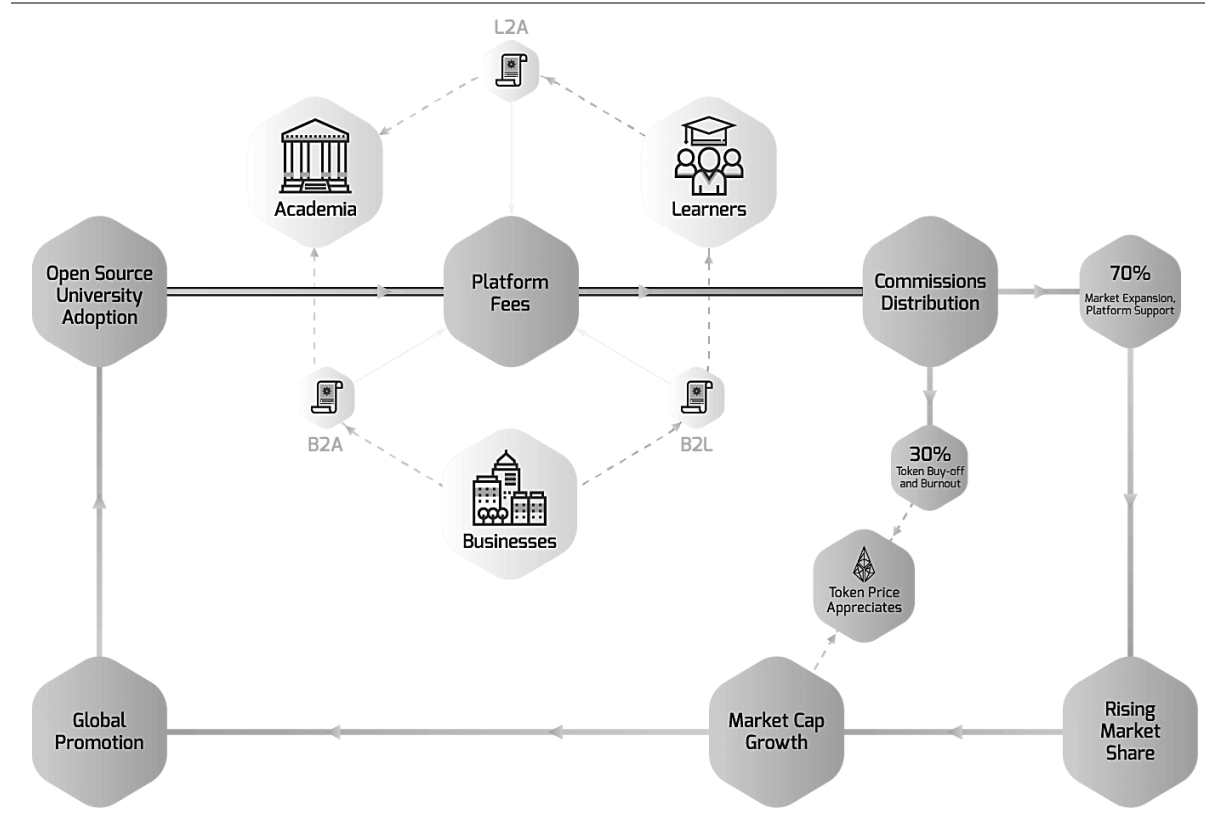
⁶⁴ Details available at <https://github.com/paritytech/certifier-website/wiki/PICOPS-Developer-Guide>.

Section 12. Token Circulation

When the OSUni is mature enough and all participants can collaborate and benefit by using it, it is necessary to take reasonable fees to be able to continue working on the customer experience and all the extra requirements and suggestions one might have. All fees will be taken only from users which have made transactions using Ethereum as a payment method. The token fee will be divided accordingly:

- OSUni platform will collect a transaction fee for subscriptions of new businesses and educators on the platform, aggregating paid courses on the blockchain, bidding for preparing custom courses and interview bounties dropped by businesses to learners.
- Learners will receive EDU tokens when they win certain challenges.
- Academia will receive fees from requests for custom courses by businesses and organizations, along with benefits from all paid courses.
- Businesses are gaining access to a vast pool of learners, selecting existing learning programs or preparing new, corresponding to their demands.

Figure 7. Circulation of value, incl. payments and taxes, within OS.UNIVERSITY eco-system.



Source: Project archive. (2017)

CHAPTER 2.

FREQUENTLY ASKED QUESTIONS

What is Open Source University?

- Open Source University is the World's Academic & Career Development Ledger in the process of making. It is to be empowering 7 billion learners to connect to world's top academic education and professional development opportunities on the Ethereum blockchain.⁶⁵
- We chose the name “Open Source University”, because we believe that in the digital age, learners should be able to crowdsource their studies from different providers, instead of learning behind closed doors. We provide the platform solution to enable this process, hence the name - a decentralized, open-source 'University' on the blockchain that is formed out of many contributors, providing courses and learning pathways, adapted for and by the learners themselves.

Which problems do you solve?

- OS.UNIVERSITY provides a distributed platform to track and validate (in an immutable manner) individual academic and professional development achievements for learners throughout the world. Through the platform, learners are one reach away from the best educational offerings (thanks to the marketplace side of the solution) and one reach away from hiring businesses (thanks to the job matchmaking side of it).⁶⁶

How do you solve it?

- By using smart contracts, we store all the certification, reflecting learning and development progress of the learners into the blockchain and give them access to education and professional opportunities, corresponding with their interests and achievements. Businesses on the other hand benefit by targeting the right candidates for their specific needs without the need of going through third parties.⁶⁷

⁶⁵ For more information, watch our animated video explainer: www.youtube.com/watch?v=KR9j-EeTwfI.

⁶⁶ For more information, watch our video on how we help out the recruitment industry: www.youtube.com/watch?v=4VPOtCfX2UM.

⁶⁷ For more information, watch our video on why we use the blockchain to solve the problems in mind: www.youtube.com/watch?v=894Fq9znM1s.

How will it work?

- Due to the technology we leverage, we will operate in a unique manner, different from any other educational or workforce marketplace - the blockchain will bring trust & traceability to all certificates/degrees issues by schools, academic, corporate and life-long learning service providers.
- Therefore, our user base will serve businesses as a great hiring pool, full of candidates with indisputable credentials, while in parallel, OS.UNIVERSITY will be used for workforce development (e.g. businesses will be able to manage their L&D processes through the platform, cutting off spending on corporate systems, as the blockchain will provide the perfect medium for the goal).⁶⁸

Is there actual interest from the companies in using cryptocurrency?

- When it comes to academic clients, we have some of our first early adaptors throughout the academic world, e.g. VUZF University, a Britain-accredited higher education institution that will be leveraging our platform in order to digitalize and validate on the blockchain information about students' credentials. There will be a "SaaS" model for authorization of such transactions of information over the network in what will otherwise be an open system. We will scale up our EDU tokens' circulation in a market with more than 20,000 other universities of which only a hand-full have already embraced the credentials' digitization model (e.g. MIT, University of Cyprus, etc.).⁶⁹

What are the obstacles in using cryptocurrency now?

- The main obstacles are related to the fast growth of the crypto-community, which leads to extreme 1) volatility (situation which potentially stops institutions from adopting crypto/EDU payments) and 2) fragmentation of cryptocurrencies, chains, and products built on top of them. The latter means that different universities and different companies are building of joining alternative blockchain projects, which are not always constructed with interoperability in mind.

⁶⁸ For more information on the end-to-end concept, watch our interview at www.bloombergtv.bg/investbook/2017-10-10/balgarska-platforma-osnovavashta-se-na-blokcheyn-gleda-kam-revoljutsiya-v-obrazovanieto.

⁶⁹ For more information, watch our video on what benefits our early adaptors from the academic world find in leveraging the platform: www.youtube.com/watch?v=UOjx_0JFI_I.

- Having looked into this, OS.UNIVERSITY is aiming to create a multichain solution that does not limit itself to Ethereum or any other protocol – our EDU token and the smart contracts it circulates around (L2A, L2B, B2A) are being introduced with the idea to operate independently with the prospect of connecting our distributed app to another other blockchain out there.

What is the business model?

- With the businesses as the clients in mind, they benefit from OS.UNIVERSITY by matching with the right candidates while excluding third parties from the process, thus saving time, money and fixing scalability issues on time.
- There are many online service providers, working in the field of B2L relations (business-to-learners). However, our offering is unique. The above mentioned B2L services will be charged a small transaction fee (far below the commission that recruiters take) and if using the EDU token as a mean of exchange, the fee will be waived, incentivizing businesses to use the token, leading to a surge in its value.
- Last but not least, the educational marketplace model - we will earn by enabling learning providers to sell their offerings and validate the credentials they are issuing as a service - all done through payments in cryptocurrency, incl. our very own EDU(X) token.

Who is your target customer?

- Because of the lack of decentralized way to find, organize, track and verify learning achievements and professional accomplishments throughout one's academic and career path, our end-user/customer is the learner – on a high-school, university, professional or life-long-learning stage. The user interest drives Academia and businesses to leverage the platform for which there are the above business models for monetarization (i.e. as a workforce and education marketplace).

Why are you sure that stakeholders will cooperate & use your ecosystem?

- Because of the unique tradeoff it offers to all stakeholders. The model of the decentralized "credentials wallet/diploma" which feeds data about learners' achievements on the blockchain, serves as an API between the

learners and interested companies, and is at the center of a distributed educational marketplace where one can find, pay for, and organize his learning pathway. Educators see this as a sales channel, companies – as an HR tool, and learners – as an invaluable digital identity product that is free of charge and full of opportunities for personal and career advancement.⁷⁰

What has already been done?

- OS.UNIVERSITY was launched as a research initiative back in 2015 and since then have gained recognition throughout the academic and corporate communities worldwide. We have been recognized by the Bulgarian Ministry of Education, the European Commission, AIESEC Global & EY Latvia, Hewlett Packard Enterprise.
- Our project has been featured in leading international scientific conferences in Riga, Brno, Sofia, etc. Our team of technology experts and business and research advisors spans on all continents, similar to the nodes behind our distributed application.⁷¹
- From development perspective, our dedicated team is approaching the completion of the alpha-version of the OS.UNIVERSITY platform in Q2 2018. We have a public roadmap that includes milestones and planned next steps, available at <https://os.university/platform/>.
- Next to that, our YouTube channel contains dedicated project videos about project's past, present and future, which might give you the "full picture" and some useful behind-the-scene insights.⁷²

What is Open Source University's legal structure?

- The legal entity behind OS.UNIVERSITY, i.e. ReChained Ltd., is incorporated in Republic of Bulgaria (European Union) where our blockchain development team is based. There is a broader consortium of partners working on the Open Source University project that includes private companies such as Cobden Partners (UK), a renowned provider of financial consultancy services, based in London.

⁷⁰ For more on the cooperation within the token economy ecosystem, read <https://os.university/crowdsale/>.

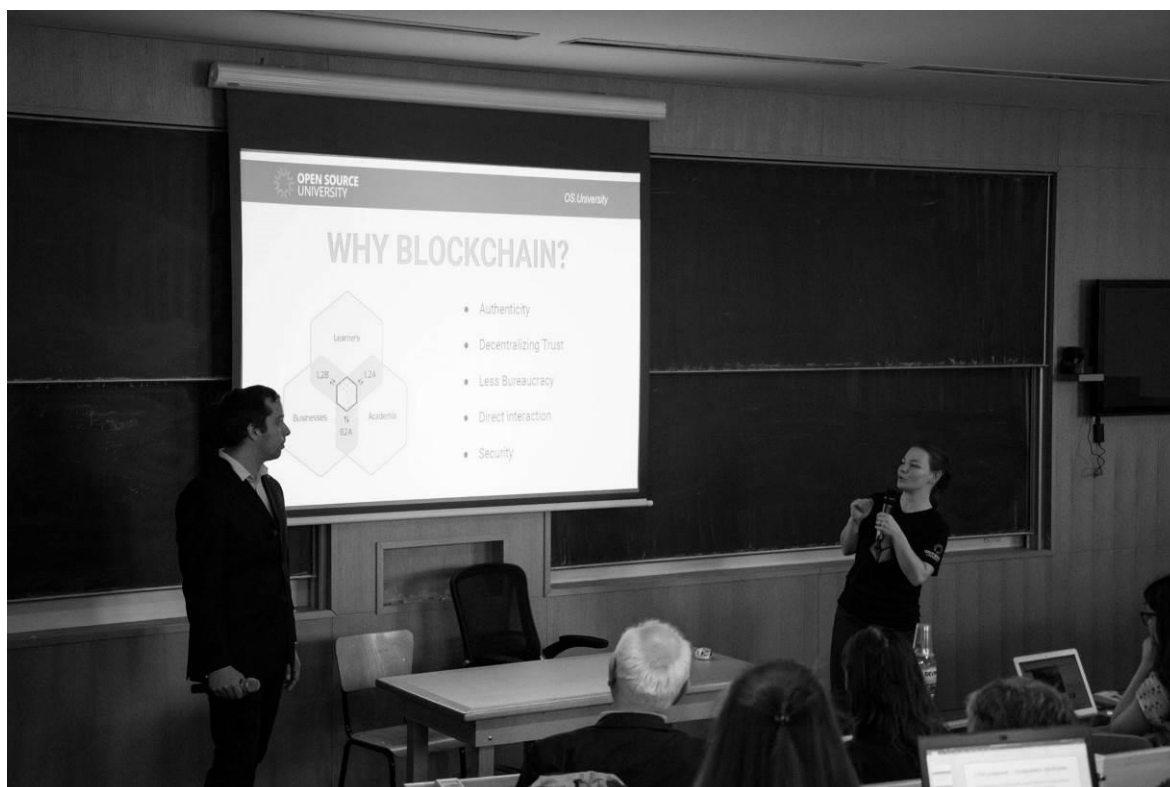
⁷¹ Any computer that connects to the blockchain network is called a node. Nodes that fully enforce all of the rules of the blockchain are called full nodes. Most nodes on the network are lightweight nodes instead of full.

⁷² Visit: www.youtube.com/watch?v=Tpoc_v1PrM8.

What are your measures to comply with local regulations?

- From financial regulatory perspective, the EDU token is a utility token (allowing users to buy educational offerings through OS.UNIVERSITY marketplace and use its other services, such as credentials validation/verification and job matching).
- The token is not a security instrument of any kind to be treated by regulators as such. However all precaution measures have been implemented proactively in order to avoid future regulatory risks and be compliant with the existing best practices, e.g. a KYC procedure has been introduced on a pre-sale stage, in partnership with Parity’s PICOPS service.⁷³
- From data protection point of view, the system does not actually save the data on the blockchain - only addresses are saved. The data is part of the certificate with which people access the system on a peer-to-peer basis.

Image 4. OSUni Chief Technology & Marketing Officers answering questions from the public at an open conference event, organized by “Legal Hackers” Europe, Bulgarian Chapter.



Source: Project archive. (2018)

⁷³ For more information on the regulatory compliance & reporting standards, read <https://os.university/documents>.

PART 3.
PRODUCT IMPLEMENTATION ⁷⁴

*„All men who have turned out worth anything have had the chief hand
in their own education.“*

(Sir Walter Scott, 1771-1832)



To succeed, OS.UNIVERSITY implementation requires adaptation towards the individual needs of the different stakeholders and communities it serves. Therefore the voice of these is decisive on the direction ahead for the project. On the image, a workshop at Campus Brazil (Sao Paulo) on how to transform the biggest metropolis in the Southern Hemisphere through social innovation with OS.Uni as a case for discussion. The project is unique, as it resembles a new form of an integrated data system⁷⁵, which depends on the inputs from its key stakeholders to produce outputs of value on individual and organizational levels.

⁷⁴ This is an overview chapter, highlighting writings/reviews about OS.UNI (ownership of these stays with the authors). The author of the book is curating a list, reflecting how the key stakeholders are perceiving the project.

⁷⁵ An integrated data system (IDS) allows linkage of data from various stakeholders for more holistic information to better understand the complex needs of communities, inform the design of new strategies and interventions to address those needs, and evaluate the effectiveness of programs, policies, and projects on the desired outcomes.

As a long-time social innovator and an open source researcher & enthusiast, I had a cultural shock observing what the blockchain world is turning for just a few years' time. What started as a rebellious movement, equipped with the bold vision for a fairer and more democratic world, driven by open-source technology, today has become a highly commercial ecosystem where aggressive digital marketing is dominating over conversations about real-life problems that exist and the visionaries that are on a quest to solve them.

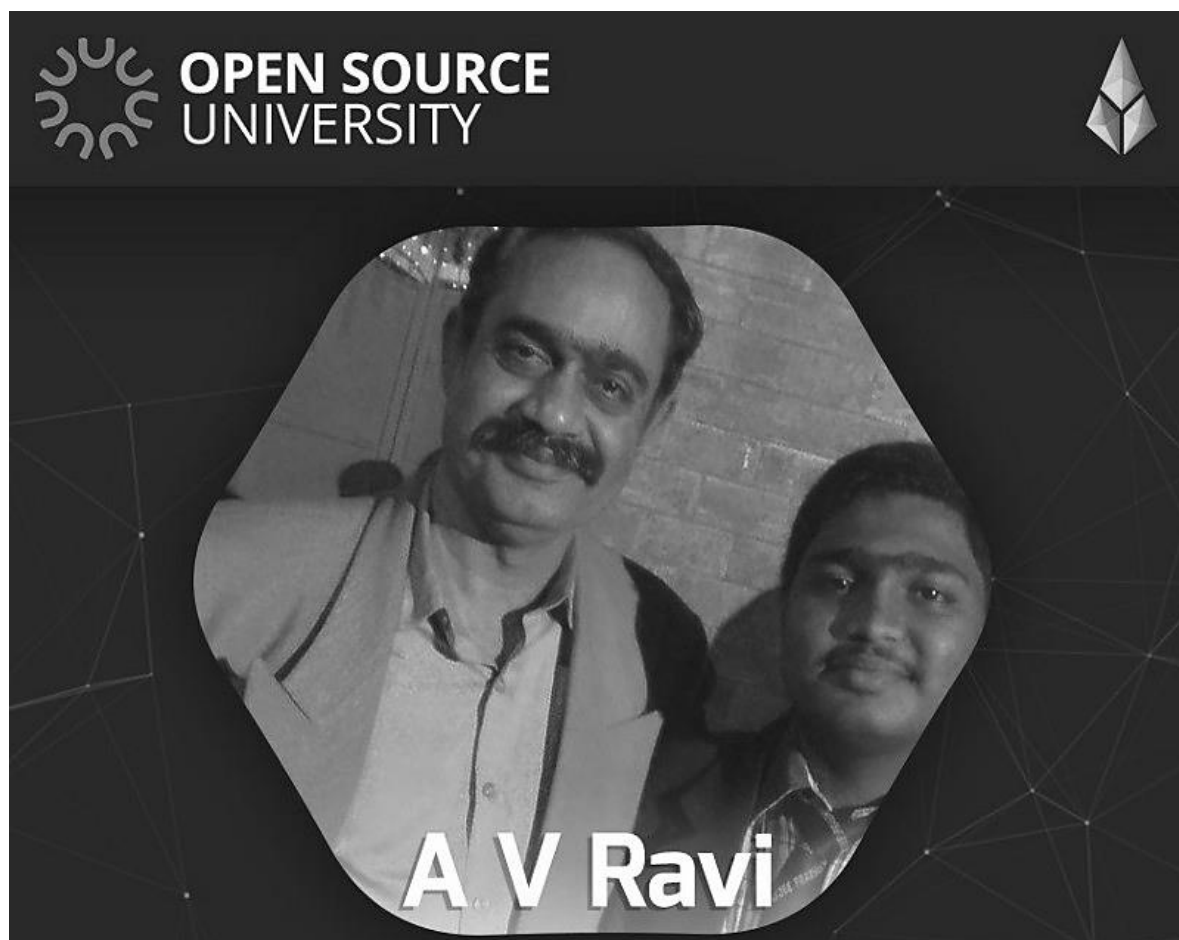
The blockchain is in many ways about cutting the “middle-man” (hence cutting cost and democratizing transactions), yet the blockchain industry is flooded with all sort of men in the middle—marketing-dealers, pitching themselves as conference organizers or claiming to be journalists, etc. Among them ICO ‘experts’, ‘influencers’ and others, promising to bridge the gap with the global audience, while creating a void along the way, polluting the system.

Right from the start of our R&D journey 3 years ago (leading us steadily to www.os.university launch today), our team paid huge attention not to fall into the trash-marketing trap that I am observing all around the blockchain-world, no matter what consultancy we receive from industry ‘guru-s’ and what metrics we are shown, based on industry ‘best-practices’.

The value of the Open Source University decentralized platform and its underlying research work is far bigger than the cheap noise many crowdfunding campaigns create while they last without the intention of building a long-term community and product. We are about to redefine the world of learning and development not by flooding forums through missionaries, but by expanding our global team of corporate, academic and NGO leaders, whose voices are captured within the following chapters.

For this purpose, we started the OS.UNIVERSITY ambassadors’ network that stands behind our vision to create world’s academic and career development ledger on the Ethereum blockchain. One such change-maker that we met along the way is Mr. A V Ravi—our project ambassador in Eastern & North Eastern India. With more than 18 years of corporate experience behind his back, he is now helping graduates find employment through his “Pathfinder” project and his engagement with OS.UNIVERSITY (Image 1).

Image 1. OS.UNIVERSITY introduces its first ambassador to India to the global audience.



Because of our unique approach on running our token sale campaign —by counting on change-makers, instead of noisemakers, I am always happy to see our project highlighted in international media. And I can recognize a good media when I see one, given my background as a founder of award-winning media projects. Some of the brightest independent publications are highlighted below.

If you like what you see on the pages to follow, in terms of both concept and approach, get in touch with me to discuss how you can get on board of our global project, empowering 7 billion learners to connect to world's top academic education and professional development opportunities on the Ethereum blockchain. We need representatives in each nation around the world, in each community, university, and corporation. Read our white paper and our one-pager.

It takes a village to raise a child. It takes a global village to crowdfund and implement a product as an outcome of a project, aiming to re-engineer a 1000 years old system. But it takes just a few minutes to dedicate on making that product better through feedback & ideas in order to achieve its goals and purpose.

CHAPTER 1. TESTIMONIALS & REVIEWS

Below are some testimonials, related to OS.UNIVERSITY – not an exclusive list, but diverse enough to represent the scale and the mood within the community.

Yana Vangelova, Chairwoman of the National Students' Union and Member of the General Assembly of the European Students' Union:



„I see an opportunity for us to benefit from the OS.UNIVERSITY platform both as students, but also as a team, representing 250 000 of our colleagues. We find the idea to organize common training programs, leveraging the shared resources within the system, appealing, given the fact it would enable us to protect students' rights and interests more effectively”.

Georgi Ganev, Professor of Economics at Sofia University, Economic Research Program Director at the Central for Liberal Strategies:

- *“Curating learning content from different sources, turning it into comprehensive educational and career pathways, apart from all its other merits, enables those who are not involved in the formal education system to develop their skills and potential systematically and sustainably in an ever-changing business environment.”*

Nina Naydenova, Deputy Minister of Youth in Bulgaria, 2015-2016:

- *"The OS University project removes the borders between Academia, public, non-governmental, and the business sectors – a cause worth supporting for a striving economy, because it provides new opportunities and ways to tackle existing regional, social, and economic inequalities, affecting millions, but of greatest proportions among young people."*

Justin Looney, Eastern Florida State College:

- *“I am both proud and happy to be part of this project. I work in higher education in the United States, and have been thinking about better ways to manage student records for some time. I have found education systems in general are built in isolation, and independent from each other, with varying degrees of security, and implementations. I support this project because I believe that a platform that stores learner data on the blockchain securely, which business and other education institutions have access to will revolutionize education and hiring processes.”*

Apart from receiving a big number of personal and organizational endorsements from representatives of the academic, business, and public sectors, OS.UNIVERSITY is among the few crypto-projects to receive warm praises from industry-leading platforms, such as “ICO Market Data”, which are in general quite conservative when it comes to reviewing and assessing projects as an independent comprehensive ICO platform.

Image 2. A positive review from “ICO Market Data” among other such assessments.



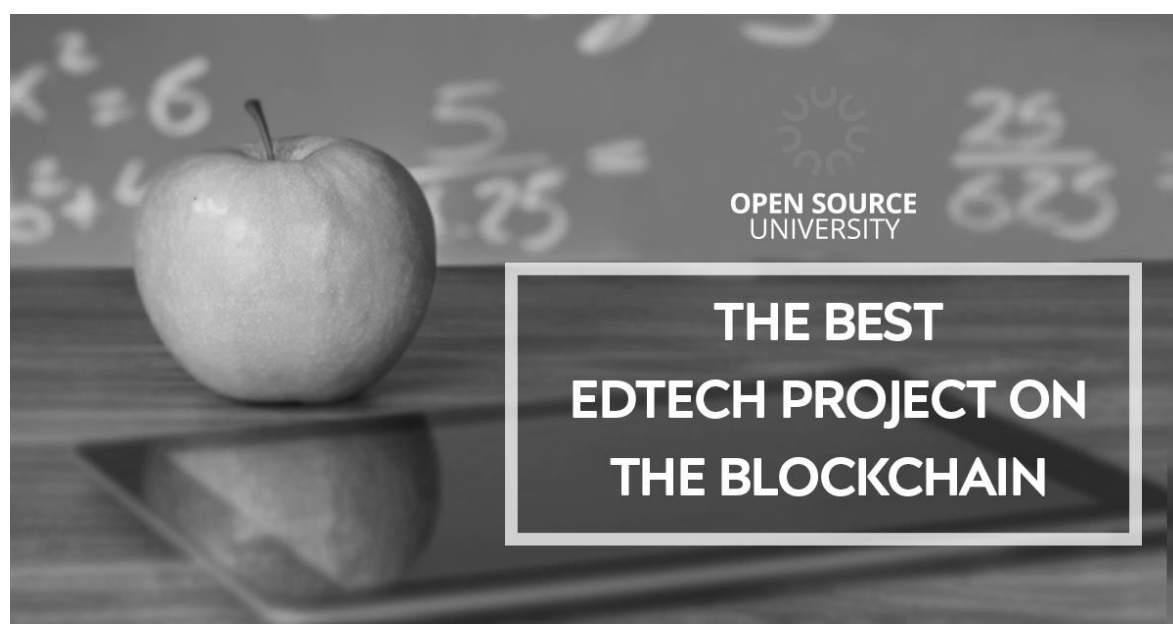
Source: Project archive. (2017)

Given the diversity within the crypto-community, not all positive reviews come unconditionally. “Bitcoin Exchange Guide” recognizes the potential of the project as an entity, especially one that *“works to verify and record user credentials while making them transparent and available to businesses sourcing new candidates”*.

The “Guide”⁷⁶, however, warns that if OS.UNIVERSITY is to impose “*some strange proprietary standard that doesn’t quite fit with today’s accreditation schemes*” (when it comes to the types of credentials that are going to be supported by the system), the project might have hard times in terms of mass adoption. Of course, this is not the case - OS.UNIVERSITY team is working on introducing an open industry standard, both vendor & protocol-neutral. Given the early stage that the project is in, though, such community concerns do make sense and it is up to the team to resolve any doubt that remains.

Finally yet importantly, a third type of reviews come from a group of experts that differ from the rest. That is because these are bots, which quantitatively and qualitatively assess the data, related to a specific project and the team behind it. “ICO Bench”, one of the leading portals in the field, has a powerful AI-driven mechanism to execute around it. It compensates for the short-ends of the not-so-transparent human-expert assessments on the site, many of which are coming from paid mercenaries, instead of unbiased professionals.⁷⁷

Image 3. Highest industry score (4.9/5), provided by “ICO Bench” assessment bot.



Source: Project archive. (2017)

⁷⁶ Review is available at: <https://bitcoinexchangeguide.com/edu-crowdsale/>.

⁷⁷ To make this part of the book as unbiased as possible, we have included reviews, regarding OS.Uni implementation as an edtech product, that come not only from team members and supporters of the project, but also from a wide range of independent professionals, which share different levels of optimism and excitement when it comes to applying blockchain for learning and career development. Every attempt has been made to curate the chapters to follow with all the meaningful articles that are publically available as of March 2018.

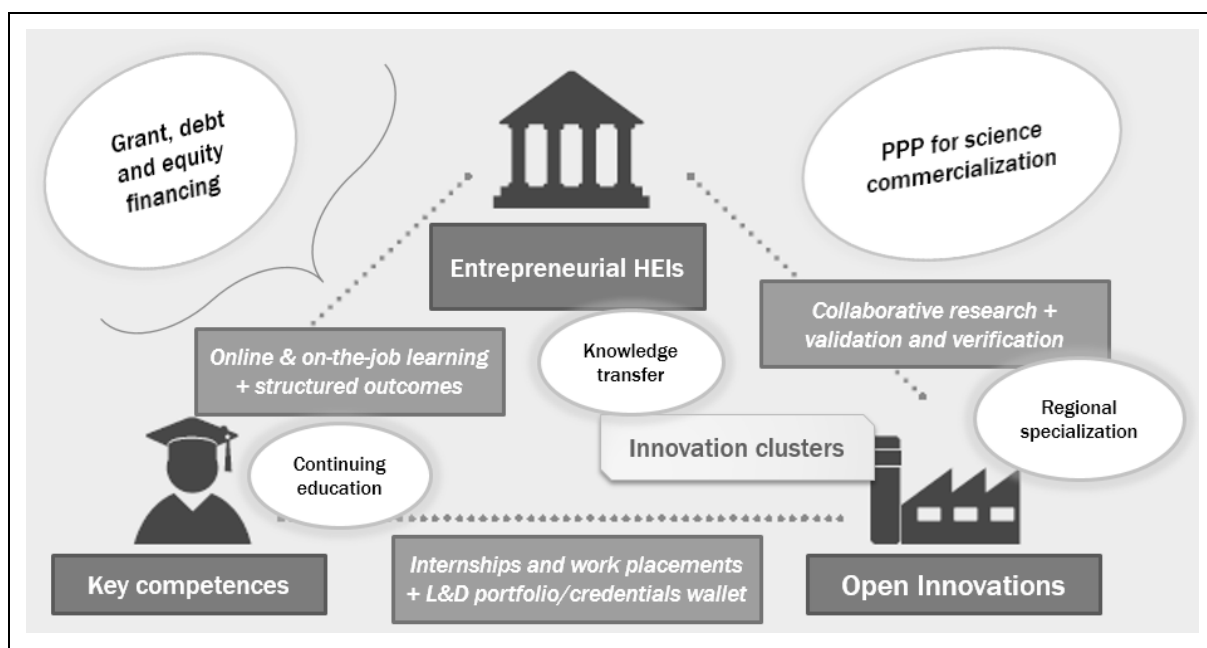
From Mystery to Hype. Who's Who in Blockchain for Education?

By Prof. O. Andreev, published on OS.UNIVERSITY blog, April 4th 2018.

How does the "blockchain in education" landscape looks like today? - a mix of academic pioneers, decided to change the course of learning and private entities, riding on the crypto-hype, decided to monetize this change. We at OS.UNIVERSITY introduced the concept for building a system to open-up the educational world through blockchain technologies back in 2015. We started with a doctoral research project at the Technical University of Sofia and in a certain way we seeded the market for the number of recent "blockchain in education" ICOs by disseminating our research across the industry.

On a side note, which is the world's first blockchain project in the field of education and professional development might be a more interesting question than it sounds. Many initiatives claim to be the pioneers. A closer look at a specialized ICO-portal, i.e. ICO Bench, shows that at least 4 out of 5 top-rated projects claim an identical badge of honor. To answer this question, we need to look into the history of the projects concerned. In the case of the OS.University, it is the only one to be dated back to 2013. Below there is one of the earliest research papers on the project (figure 1). The paper describes the principles of operation that are today outlined in the white paper and the roadmap of OS.UNIVERSITY.

Figure 1. A slide from the keynote paper, presented at the 1st international young scientists' conference in Albena, chaired by the Minister of Education of Republic of Bulgaria.



Source: Project archive. (Albena, 2013)

If this scientific paper was hashed on the blockchain, maybe it would have been easier to put an end to the dispute. It will definitely be easier in the future. Today, OS.UNIVERSITY as a research project needs OS.UNIVERSITY as a technology solution to claim its position as a blockchain pioneer in the field of education the same way any learner and any employee need it to strive in the competitive academic and career development landscape. It is not simply a matter of personal claims and checks; it is a matter of building a tool for providing indisputable digital identity in a globalized, digitized world.

This is precisely why the Technical University of Sofia paved the way – because we see the bigger picture. If academic records remain dispersed in an ever-globalizing world, described as 'the information age', information would always be a subject of uncertainty, fraud, siloed bureaucratic governance, even loss and destruction. A subject of ignorance if you like, simply because the transfer and verification of information is too slow or too expensive of a process for interested stakeholders to run on their own without a number of trusted intermediaries along the way.

Today, companies and governments around the world are not able to verify efficiently a broad range of claims, ranging from owning a diploma (that you may have invested thousands of dollars into) to giving a credit for a fundamental scientific breakthrough (that you may have invested years into). These require complex fact checking, going through a disorganized and slow network of information brokers and men in the middle, adding nothing but cost.

At the end, these information-coordination bottlenecks are not just a personal issue to handle (multiplied by billions). They represent a serious roadblock to processes, affecting millions of citizens, learners, employees, and institutions in a globalized knowledge society. Sometimes the problem is indeed related to prospects of academic and career development that we face in Academia. You may eventually prove your claims and resolve any disputes "off the chain", but the gains are always too little, too late. In other cases, it is all about institutional and personal credibility (as in the case of the blockchain initiatives, claiming the same badge of honor). In all of these cases, it is about finding a way to re-enforce identity and trust in a strangely what is an ever more consolidating, yet ever more decentralized world.

To provide an answer/solution to this broader question of building your credible digital identity when it comes to education and career development in particular, we need a systematic approach. Throwing claims back and forth is neither effective, not efficient on the global stage - it still needs arbitrage. A system which records academic, research and professional development accomplishments and achievements is a whole other story. OS.UNIVERSITY is creating one such system through a systematic effort 3 years in research and development. Being able to validate and verify your claims through a trusted decentralized platform on the blockchain is among OS.UNIVERSITY main goals, but it goes in synergy to the other merits in regards to bringing the gap between education and employment.

In parallel to ours, other renowned academic institutions advanced their research. We are very much looking forward to establish a hub for cross-pollination of our findings in the months ahead. A third group of early adaptors of the blockchain technology appeared in more recent days, along with the crypto hype. To give you an idea about what they do in the field of learning and professional development, here are a few of them and how we differ:

- **“Indorse”** - it is a LinkedIn type of social network with somewhat complex wisdom-of-the-crowd endorsement & incentivization mechanisms. While it gets close to the idea of using the blockchain for validation and verification of achievements/accomplishments, it does interpret these concepts in a bit of an odd way. Difference with OS.UNIVERSITY? Well, OS.Uni introduced to the world the “L2A” (Learner-to-Academia) smart contract. This smart contract allows learners to register their proofs for accomplishments and skills in the forms of degrees, certificates, etc. and have them verified by the issuers. The blockchain serves as an environment to record these requests and transactions of data, so that your claims get "whitelisted" the same way a property register on the blockchain would serve property owners/buyers. It is a straightforward process optimizer, a notary, sticking to what matters - indisputable, immutable validation and verification of data, adding real value to the industry, solving its problems, related to the dispersion and quality, hence trust in the underlying information. It is not a LinkedIn-wannabe, something that "Indorse" tends to lean towards.

- **“Tutellus”** - currently an active provider on the MOOC market, Tutellus is one of the hundreds of online course providers, a fraction of the marketplace that OS.UNIVERSITY envisions in order to democratize access to education. Think of “Tutellus” as a merchant and of OS.UNIVERSITY as a decentralized "Amazon for Learning" type of marketplace. As an expert, I do not believe that blockchain is a technology for building content on top of it, whether that would be learning content or games, or whatever other idea is out there. Blockchain as a technology is an improved distributed database, a decentralized ledger, so you better use it as intended. It is simply not an LMS, a learning management system. Therefore the main difference - our tokenized marketplace model and “B2A” smart contract (Business-to-Academia) are there to enable content creators to meet existing demand and create new by collaborating with other knowledge producers and consumers, not to compete with thee. The latter is something that Tutellus is decided to do, most probably driven by earlier monetarization success of “BitDegree”, another “Coursera” on the blockchain. OS.UNIVERSITY looks into the blockchain technology as a connecting, enabling layer, a smart grid for connecting demand and supply, a smart grind for enabling information coordination relationships.
- **“Profede”** - it is supposed to change recruitment through change of ownership of career data. Similar to the OS.UNIVERSITY’s “B2L” (business to learner) smart contract, it provides a channel for exchange of data between the stakeholders. However, instead of focusing on the basics (i.e. how to improve the quality of the flow of information), “Profede” focuses on aspects such as monetarization primarily. Every time an ICO speculate around this subject, they simply forget that promises for decentralization, ownership rights are not enough – you need to improve the system strategically, not just its mechanics. As an example, in the case of OS.UNIVERSITY, our B2L contract has its value rooted within the B2A and the B2A ones - learners, employers and HR partners exchange information on the principles of many-to-many. It is not just about you as a candidate sharing data with an interested company, it is about the company sharing its insights with you - on the way to move forward in your learning, career development.

In a nutshell, OS.UNIVERSITY helps educators market their products, while helping learners market themselves. This happens through a decentralized marketplace and a distributed learning and development ledger. They achieve their aim by leveraging three smart contracts that are outcome of a long-time research - B2A contract, B2B contract, and a B2L contract.

The other projects that are put forward as examples within the current review are not necessary of inferior quality - they are simply addressing the opportunity partially, in an uncoordinated manner. While they lack scientific peer-review to back their theses, each of them have received enough public backing from a variety of crypto-generalists to pass the scam-test and be included in this article.

Being trendy on the markets, however, is not close to being of greater value to your stakeholders. Take viral apps such as Snapchat as an example. Born as a 'sexting app', "Snapchat" went up to a 20 bln. dollar valuation not that long ago. Would teenagers really care if it is gone tomorrow, if it is substituted by a more viral app? I do not think so. Yes, of course, early investors would care about the money they would lose. So choose wisely if you are investing in a startup venture (whether in edtech, crypto or elsewhere) that has no deeper fundamentals and connections to the industry it is operating in. What the purely commercial-driven outsiders are missing in their concepts for application of blockchain in education, is the need to act in an integral, scientifically-driven manner. Enabling educators to reach effectively to learners cannot be done without enabling learners to reach effectively to businesses. The latter also need to be close the loop by reaching out to educators. It is an input-output story. Break the chain and you will have not a blockchain use-case, but a short circuit in your business model.

In other words, if you are a blockchain startup with edtech aspirations, and you try to address the big picture superficially, you would either end up not having a proper token circulation model to sustain your project or you would produce a decent tool that somehow manages to provide utility to token owners, but without a real need for the underlying blockchain technology.

OS.UNIVERSITY will continue to seed the industry with ideas, but quite frankly, we need the challengers to go through them more carefully. Therefore you should look at some important announcements around new educational initiatives that we will make in the upcoming weeks and months.

The Future of Education Now

By Milena Ribarova, published on OS.UNIVERSITY blog, Dec. 4th 2017.

Milena Ribarova, Corporate Ambassador to the OS.UNIVERSITY project, has 20 years in the Finance and Banking area. She is passionate about bringing a bright future for the Education and Mastery of the Generations. She is optimistic and open and loves to work with people and to contribute to their growth. Her moto is “If there is no road, build one!”

What an incredible change through the years we have seen in the automotive industry. And what about the smart green buildings compared to the no electricity ages... Even in the health industry now we are saving lives with methods far, far away from the past... And what about the education? No changes. Everything is the same.

We all want young people to be pro-active, adaptive, and flexible. To think in future, to plan better, to innovate and to create more opportunities for themselves. We cannot expect this to happen when we do not teach them about future, but teach them in the past only... Now it is the right moment for us to CHANGE, to INNOVATE, to break the red tape and to give to our young generation power and freedom to think and learn ... in the future.

Image 5. Mockup screen of OS.UNIVERSITY alfa-release, scheduled for end of Q2, 2018.



Source: Project archive. (2017)

- **The Issue**

Students' thinking is changing fast. The old educational approaches cannot keep them staying in the Academic halls anymore.

Nowadays, it is hard to choose a University to study in. Many times not all disciplines in the University's program are interesting for the student. Preferring one University instead another always means that the student compromises and loses the opportunity to learn some interesting disciplines which are in the academic program of the not-chosen University. Why does it happen? Why are the academic programs not customized to fit all student interests and requirements? This demotivates the students to really learn and prepare themselves for their professional life and this impacts the people and business development at the end?

- **The Opportunity**

Universities are in a situation that needs change of the methods they prepare their programs. They need to align with the needs of the business—the companies that will hire the students. What is important for the business to grow should be incorporated in the universities' disciplines better giving the students more opportunities to fit better in the professional world.

An opportunity is raising for the Universities to collaborate with them and to guarantee to the students most useful combination of knowledge areas. Each student could be allowed to choose what to learn from disciplines of different universities while studying in one of them and to receive an accredited diploma for his Bachelor, Master or higher degree. This approach is going to increase the motivation for learning, number of the students and will bring more knowledgeable people to the Business.

- **The How**

Blockchain technology is here to facilitate. Using its potential we can store and make transparent and accessible thousands of courses from different universities across the world. Each University can create a backbone of the educational program and students can reach and learn from the sources and disciplines of other universities and academic institutions, related with the main subject of the education.

The courses will have ratings so the universities will have a feedback on their value for the student and the hiring companies. The companies will give their view on which are the most valuable courses for the students to fit better in their business environment. This will help Academia to adapt their programs to be more useful and more interesting and to serve better the needs of the business.⁷⁸

Image 6. OS.Uni presents at Bulgaria's leading university-business cooperation forum.



Source: Project archive. (Sofia, 2017)

▪ The Advantages

Using the Blockchain this can be done at almost no cost for both student and the university and it will be time—saving also. The business from the other side will achieve a higher level of the successful hiring of well-educated, flexible and adaptive employees. And students—they will keep their minds fresh. They will have the opportunity to reach the unlimited opportunities of learning and to develop themselves as open-minded professionals looking to the future.

Why do we need to think out of the box? Just think that there is no box!

⁷⁸ Today's student information systems (SIS) do not allow for effective two-way means of transfer of information from elementary to secondary to higher education or learning on-the-job and back to the educational system. The current software provides a limited capability of exchange of information from one system to another and usually requires a designated individual who is capable of such information transfer. This has led to an increasing amount of delay, increase in cost to each institution and decrease in quality of educational products and services, due to the broken "feedback loop", excluding what the other stakeholders have to say.

The Steemit Community: a Project to Revolutionize the Labor Market

By Fran Polanco, Venezuela, published on OS.UNI blog, Dec. 4th 2017.

Franc Polaco, blogger at steemit.com/@guitartech, has At SteemIt.com, we at the Open Source University project launched a contest to find answers to some of the following questions: What is the potential of a global learning platform based on open source blockchain technology to change traditional secondary, university, and continuous education? What might be the changes in corporate learning and development while using a platform that is beyond institutional and national borders? How will this change the way businesses hire?

▪ Open Source University Value Proposition

How many times have we not been invaded by uncertainty when undertaking new studies and facing a competitive and challenging work field as a result of the inherent desire to excel in a field of work or work environment? However, many times we adopt the position of an accumulator in terms of diplomas and certificates of study refers, in fact sometimes we question why we have invested some time and money in the training of a certain area, or if this will bring some benefit to future within the work year.

OS University is conceived through the fundamental idea of channeling and revolutionizing the whole system of educational training and therefore the labor market, allowing users to attach all their abilities experiences and levels of studies within the data of OS University (EDU), on the Ethereum blockchain. As a consequence of the application of a decentralized and modern information system, it will be possible to make use of this information to interlace patterns of action between; academies, areas of study, companies and organizations that merit certain abilities or talents that an individual possesses.

▪ Maximum Utilization of Capabilities

Undoubtedly this platform generates a plan of action before the intricate correlation that exists between the individuals in formation, companies or organizations that need them, and the academies that are responsible for promoting learning and development within an established society, and even this is reflected in the demand and opening of courses or online careers (which has gained a lot of ground today).

This ideal of processes provides a series of benefits to all parties, since within these systematic processes concatenated the data provided ensure greater efficiency and effectiveness when recruiting personnel for a particular task at the hands of an organization or company, which has in turn raised their needs within the labor market. Finally, academies and online platforms work on these needs to provide equity and innovation in the field of education.

- **Processes**

OS University is based on a series of processes intertwined to revolutionize the canons of training and work practice.

- **L2B:** In this chaining stage, companies or organizations can quickly filter users who possess the capabilities they require.
- **L2A:** The student in question will be able to enjoy a secure storage, referring to his profile as a professional and make use of the suggestion algorithm based on the commercial needs projected towards the demand of skills.
- **B2A:** It allows informing institutions, companies and academies about the needs within the learning and development market, therefore filtering in a more optimized way their proposals and study plans in a particular stratum, which has certain training interests.

All this and more can be achieved through the impulse of “EDU token” who will function directly as the gasoline that will allow the advance, development and maximum use of this decentralized platform which promises to revolutionize the training system both in person and remotely, In turn, provide equity within the growing labor field.

- **The future is Now!**

If we think in the long term as technology evolves and day by day the most complicated processes are systematized in search of a more effective exercise, which provides a certain amount of benefits to the population in general, we could think that OS University would be giving a great step towards the efficiency of the processes of development and equitable formation, propitiating sources of employment within a given region and guaranteeing at a certain point, the correct occupation of skills by an individual.

Below is an extract of other “Steemit” posts, featuring reviews on the project:

▪ **Alvin Auh, Lecturer, Gaya institute of teacher education, Malaysia:**

I am an educator involved in the planning, design and teaching of students in my institution. Being involved in many forums with hiring managers, learners and education institutions, I think that Open Source University has nailed it by introducing blockchain technology to address various issues that are faced by educators, learners and various businesses. They do so not just because blockchain is the new 'in-thing', but by addressing the challenges in these various fields.

As much as there are many advantages, I think OSU can go further, leveraging the connections between Academia and businesses to curate the right skill set required by companies. Want to work for Google, but there is no “Career at Google 101” in university? No problem, OSU can curate a list of courses for that.

I believe that the developers of Open Source University would be able to roll out a more refined system that will benefit not just the education industry, but the various industries that hire through this platform.

Originally posted @alvinauh.

▪ **Andrés I. Torres, Student, Information Technology, Venezuela:**

The best changes (or better, revolutions) involve rethinking what has stayed the same for years and years, and questioning what has been seen as unquestionable. Academia, for all the involved parts, is an area that has remained close to its roots and traditions ever since the first academic associations way back in History. But with the apparition of new technologies, the blockchain and a globalized, interconnected society, it is time to reinvent how we treat education in our lives.

Open Source University is an innovative, smart and secure platform that will allow education to become global and decentralized, reaching out to small countries and people with low resources or income, taking in consideration the opinions of the whole community.

I am confident it will bring every user a vast range of professional and academic opportunities and serve as the start of the future of Academia.

Originally posted @andresitorresm.

Connecting the Dots between 7 Billion Learners, Businesses & Academia

By Christos Hatjoullis, published on OS.UNIVERSITY blog, March 1st 2018.

▪ **Learners for Life**

I consider myself a Lifelong Learner & studied at several institutions across the arts from Dance & Drama to Art History, Photography, Media Studies, Visual Studies & Multimedia. Apart from the many modular, open transfer credits I accumulated, I have a B.A & a P.G.C (Post Graduate Certificate). (If I added up all the other open transfer credits, I would probably have almost two complete degrees.)

▪ **Where is all my Certification Stored, Logged and Officiated?**

Nowhere. I do not even know where any of my certificates are. In a folder, somewhere on one of my many bookshelves, probably, hopefully. Imagine If I could organize all of these officially recognized qualifications in one accessible place with complete integrity, accountability and available for potential employers to search (at my discretion?) If I really wanted to complete that long sought MA in screenwriting, but couldn't do it any other way than as a correspondence course, how would I find & select the right course from among the many out there?

▪ **I am also a S.M.E Employer⁷⁹**

I run a business with very specialized skills requirements. When we employ a new member of staff they are usually graduates at minimum. It takes a further 1-2 years of in-house training for our designer / animators to become fully trained. It is difficult to find people with the right skills from institutions who provide the highest quality education and attract the best students. It can be costly & time consuming sourcing the right people.

If I want to send my staff out for further training, where do I go? How do I evaluate what and where is the best institution for my needs? It can become a resource intensive and expensive activity. SME's need to save as much expenditure as possible in all areas, to be profitable and competitive. Making the right choices can be the difference between success and failure. Recruitment is an expensive business.

⁷⁹ S.M.E (Small to Medium Enterprise) is a business with fewer than 250 employees.

- **I Started off in Recruitment**

After finishing my studies, I applied to a recruitment agency for my first real job. They instead made me an offer I could not refuse. A unique role and an impressive package. It turned out I was good at it. I had the knowledge to determine whether given candidates (who had often just graduated), had the right level of skills to work for the best of London's new media companies. The clients were desperate to secure the top web designers / developers, digital editors, and graphic designers, all tumbling out of Universities and Colleges with amazing new digital skill sets.

It was a costly and resource intense activities for the companies involved. The agency I worked for charged up to 20% of a year's salary as a fee to find and recruit a member of staff. The clients relied solely on me to evaluate and verify candidates' qualifications through stringent interview and testing.

- **Open Source University**

After years of Research & Development, collaboration and recognition from global tech partners including Hewlett Packard, Ernst & Young and Sony Global Education, Open Source University have come up with a cleverly thought out, first of it's kind education solution. A Blockchain Distributed University composed of 3 interlocking smart contracts, providing huge value for the international business community, education institutions and of course, the 7 billion learners out there.

The distributed model addresses the 3 common problems described above and does it with efficiency and complete security, along with smart admin, algorithmic targeting and low fees. Integrating 700 higher education institutions and 60 million massive open online course (MOOC) students begins a process unseen in education before. Tokenizing the entire system using EDU tokens provides a secure liquidity for the network to operate fairly and equitably for all participants using each interlocking component of O.S.U. It is also a speculative coin investment with a high chance of a good R.O.I. As the project gathers pace, the coin value may increase significantly. It's scope is huge and so is it's potential.

- **Smart Contract L2B** - A blockchain distributed database storing learner-acquired skills. Matching algorithm connects businesses with the right candidates using big data in a cost effective, precise way.

- **Smart Contract L2A** - Degree credits are safely stored on the blockchain and course suggestion algorithms, based on current business needs allows learners to chart a dynamic and targeted learning path. It sounds like Star Trek Academy!
- **Smart Contract B2A** - Businesses can access a next generation learning and development marketplace which is both rated and filtered by discipline, again stored on the blockchain. Smart contracts handle payments, eliminating often-costly third party administration commission, processing and fees.
- **Use Case for Blockchain**

If there was ever a use case example for Blockchain technology which produces a win-win-win (or win3) solution, this is it. As the Blockchain Revolution takes hold, this is the kind of project which can encourage mainstream adoption by civil society. It is a positive use, constructive blockchain project which may over time convince policymakers of blockchain's true worth. Business & Academia already know.

*Image 7. OS.UNI will have a mobile version. The modern education system demands data to be available 24/7, up to date, and transferable at the price of zero additional “Satoshi”.*⁸⁰



Source: Project archive. (2017)

⁸⁰ “Satoshi” is the smallest unit of Bitcoin, equal to 0.00000001 BTC.

Open Source University ICO Review

By ICOPedia, published on ICOPedia.com, March 2018.

Based on the assessment of Open Source University, the rating of the entire ICO stands at 78.8% (3.994/5). This being the case, the reviewers conclude: “We believe that the developers have come up with a great product meant to serve a solid and ever-growing market. Our belief in the quality of the product as well as the strength of the team cannot be further underscored.”

The growing need for a high-quality workforce within the job arena cannot be underscored further. However, information asymmetry between learning institutions, students and the corporate world has led to graduates appearing ‘half-baked’. Open Source University has come to solve this.

▪ Product

Open Source University’s main product is their decentralized blockchain-based content provision and credential-securing platform. From this, the institution has branded itself as the provider of a ‘distributed course providing and certification platform for individuals globally’, revolutionizing how education is obtained and how institutions synchronize to ensure the best education is given to learners.

They will use this platform to link the three facets of education – the institutions which train students, the students themselves and the workplaces which these students will eventually end up in. the links between these three facets are described as being either L2B, L2A or B2A – *learner-to-business*, *learner-to-academia* or *business-to-academia* respectively.

Open Source University comes to ensure that each of these facets interact effectively and benefit in the process. This is achieved through creating a platform in which these facets can pass information on what they need the most and how the other can ensure that this need is met.

An example of such as situation is whereby companies wish to have their personnel (new entrants) receive training on a specific area. These companies may approach the institutions on this platform and ask them to train their students on that specific area before the company takes them in as new – skilled – labor.

The system also has an advantage of storing documents on the system therefore ensuring that records on all of the facets are kept safe.

- **Use of Blockchain**

The Open Source University platform is based on Ethereum. The platform is an Ethereum token meant to ensure that education reaches all individuals and that the quality of this education holds up to the standards that have been set by the employers. Given its Ethereum backing, the token portrays the fundamental characteristics of Ethereum – such as being a proof of work system – while benefiting from the fact that it is tailored towards education. The blockchain network plays the role of ensuring the security of the documents derived from students attending some of the courses as well as some of the achievements of these learners – such as their results and certificates obtained during their period of study.

The network works best courtesy of the novel idea behind Ethereum – smart contracts. Each of the facets defined above (L2B, L2A or B2A) have their own specific contracts which ensure optimality is achieved for each of the facet's needs.

For L2B, the contract ensures that the recruitment process is handled in the most efficient of manners with tasks such as sourcing and remuneration being carried out through this. B2A ensure that the employers can ensure that their specific needs, such as learners learning a specific field, are met through partnering with the institutions and explaining such needs to them. Finally, for L2A, the contracts ensure that research carried out by the learners is of high quality and is distributed to others – there is remuneration to the learners who distribute their research. Through this, all the facets within this chain benefit from the technology.

Finally, the supply of EDU tokens on the network is limited to 48 million. Moreover, with every increase in the number of transactions – especially those transactions which are with other cryptocurrencies – the supply of EDU tokens is reduced. This is mainly because with each transaction with other cryptocurrencies, the transaction cost is converted to EDU tokens and 'destroyed immediately'. As such, the EDU token value keeps growing with every additional transaction.

All the above is set to ensure that the holders of the EDU(X) token continue to benefit from holding it long into the future.

- **White paper**

The entity's white paper is an elaborate and concise document which expounds on the institution's vision, product and the solution they seek to provide. The document clearly elaborates the problem that exists – the lack of congruence between education providers, the learners and their future employers – and goes ahead to expound on their solution to this problem – the Open Source University platform which they are working on. It further explains in detail the software that will be using – they will base the token on the Ethereum blockchain – after which they explain its benefit especially in terms of security and scalability. This is in addition to providing access to the software for contributors to add on to it.

Finally, an elaborate description of the milestones set by the company's management team and advisors is stipulated with the document outlining the objectives – a breakdown of the milestone into shorter feasible targets – which need to be met during this period.

So far, most of these milestones have been met by the team.

- **Roadmap**

The company has, until now, met key milestones within their roadmap. So far, the remaining sections of their roadmap include purely the completion of development and release of the alpha and beta versions of their platform – all which are meant to happen over the first and second quarters of 2018.

Afterwards, they expect that over the course of 2019, the world will base its education system on this platform.

Despite having met all their previous milestones, in my view, their expectations for 2019 are far from realistic. I would expect that this system will take time to undergo severe marketing campaigns before reaching this level. However, their optimism, based on past experience, is not based on quick sand therefore they are expected to meet most of the milestones they have set for themselves.

- **Compliance**

Open Source University is complying with the laws of the countries within which it operates as well as the framework governing cryptocurrencies within the Ethereum network. This is mainly because the platform is still in its development stage and has a long way to go before it is globally accepted. Going forward, the

key threat would be identity fraud – which is a criminal offense – where hackers may have access to the education papers of learners if a hack is successfully executed. It is until this happens that complications pertaining different national and international laws can be discussed. However, purely on a basis of compliance, the developers have complied with the key development practices and national laws.

- **Company and Team**

The company was started back in 2015 as a research team within the education sector and has since grown to its current state, going as far as receiving awards from firms such as Ernst & Young. This is mainly due to the team’s dynamic and driven nature.

The team is led by Professor Kevin Dowd, a Professor of Finance and Economics at the Durham University Business School. He has a research incline towards private money and free banking and uses this to drive the vision of Open Source University. Furthermore, their lead developer, Jordan Jambazov, has over ten years’ worth of experience within the software development field and is the co-founder of IO Era, an IT consultancy firm.

The above being but a few examples, Open Source University is backed by a strong team, which is driving their network and growth quite amicably. Furthermore, the diverse nature of the team is a strong driving force towards their success.

- **Token Sale**

According to the company, the token sale will occur in two rounds: the pre-sale and the token sale with each sale having its own price. For the first pre-sale round (which will take approximately six weeks), the tokens will be sold at 1ETH = 1,350 EDU. Here, they expect to sell about 2.6 million EDU tokens. Finally, the second pre-sale will see another 2.2 million EDU tokens sold at a price of 1ETH = 1,200 EDU. Finally, the company will release their alpha platform after which the value of the tokens is expected to skyrocket to 1ETH = 750 EDU.

Purely from the above, it is visible that the company expects EDU tokens to have gained value over the period between the first and second pre-sales and finally to the token sale. As such, there accrue a lot of benefit to investors who invests early in the token above.

- **Readiness**

Currently, the company has its eye on obtaining funds through the sale of tokens. The development and release of the alpha platform was meant to occur during and towards the end of the first quarter of 2018. Currently, the code for this is available on the GitHub platform. As such, the developers seem to be working tirelessly towards their goal of creating the platform therefore the entity seems quite ready for the release of their product to the market.

- **Risk**

As with any investment, the risks associated with price and market movements exist. These risks especially hold true for the cryptocurrency sector which has been adversely affected by new information over the recent past. Therefore, investors in the EDU token need to be aware of the latter and understand that changes in market prices or release of new information to the market may have negative implications on their investment. It would therefore be prudent for investors not to risk money which they are not willing to lose.

- **Appeal**

This platform is expected to draw a lot of attention especially from players within the education sector. With the sector having the information asymmetry problem, assistance coming from new technology such as Open Source University is definitely going to be a plus for sector players. Moreover, given that this platform is tailored for them and accrues a lot of benefits, its appeal is high on the charts.

- **Target User Base**

The platform's target base is quite dynamic as it incorporates learners, learning institutions and corporations alike. This makes it a tall order to definitively quantify the users, however, judging from their competitors, the user base is quite large – as seen from the over 12 million subscribers with edX platform. If well marketed, edX will be a revolutionary platform and be the forerunner to the future of education.⁸¹

⁸¹ According to U.S. Bureau of Labor Statistics up to 24% of workforce change jobs annually. In a recruitment market of USD 200+ billion, blockchain-verified profiles can cut hiring period in half. Therefore, OS.UNIVERSITY target user base goes far beyond the 12 million subscribers of the edX platform that the author refers to.

- **Competition**

The main competitors are e-learning content providers. Some of these institutions are renowned and provide their content at very low cost (such as Udemy) or to a wide market (such as edX).⁸²

Despite these institutions having the above-mentioned perks, however, Open Source University overshadows them on many fronts – such as providing secure certification for its students and linking the three players within the industry and ensuring they all benefit from higher utility by using this system. This is in addition to the tokens users of the platform receive which gain value over time. Therefore, it seems from this that the university has mapped out a clear path meant to ensure they outshine their competition.

- **Innovation**

Open Source University brings to the market a new way of acquiring education and securing certifications. Through this platform, learners benefit from receiving higher quality education as a result of their future employers tailoring their education to seek the market's needs while employers benefit from lower training costs. Furthermore, certificates obtained through this platform are permanently secure and available as they are maintained within the blockchain network.

As such, Open Source University will bring greater transparency and within the sector and this, coupled with the tailored learning that institutions will provide, will be a major leap for players within the education sector.

- **Exchange**

Given that the institution is yet to launch their ICO, the company is not operating in any exchange. However, given that this is bound to change quite soon, it will be interesting to see the developments on this front.

⁸² This particular statement of the author is an example of a common misconception, regarding the OS.UNIVERSITY project. As this Chapter represents an overview of the writings of key stakeholders within the Open Source University eco-system, this particular text is kept the way it had been written by its author, though incorrect in its nature. OS.UNIVERSITY is not a competitor to educational content providers. You can think of it as a decentralized “Amazon for Learning” (when it comes to the tokenized marketplace side of the project). The market potential of one such platform is big, as according to Forbes, the online education market is worth over USD 165 billion (2016), projected to reach USD 240+ billion by 2023. OS.UNIVERSITY will be a place for existing providers to display their products and services (not limited to online learning). OS.UNIVERSITY will not compete with these providers, but enable them to reach new audiences, optimize their pricing and production models.

CHAPTER 2. SOCIAL MEDIA AND NEWS COVERAGE

What is the Benefit of Blockchain for Universities?

At Quora.com, Hristian Daskalov, OS.UNIVERSITY Project Lead.

My experience as a project lead at OS.UNIVERSITY, world's L&D ledger on the Ethereum blockchain, shows that there are six main groups of benefits that universities are seeking/interested in when it comes to the opportunity to integrate blockchain technologies into their operations (list is not ranked):

- **Brand recognition as a leading pioneer in the field**, along with innovators such as MIT and opportunities for academic collaboration on EU and broader international level (e.g. the European Commission has an extensive report on the subject).
- **Improved student satisfaction** by enabling students to participate in distributed learning experiences online and have a digital footprint of their diplomas on the blockchain, so that their accomplishment receives stronger visibility in a highly competitive job market.
- **Improved cost structure** by transforming part of the learning process online; providing traceability of all participants in courses and degrees; real-time performance information related to studies' progress (manual input eliminated); automatically suggesting suitable candidates for newly formed specializations (easier selection process).
- **Market scalability** by increasing the number of students due to the increased satisfaction; financial benefits given by the business when matching the right learner (opportunity for the business to approach learners) as well as by partnership with businesses to organize internship programs.
- **Continuous improvement of the education** - adequate to the real live students' and business' demands by receiving feedback from learners about feature improvements, rating, information about students hired; unified collaboration space with other universities.⁸³

⁸³ This benefit is not for universities only. Participating in the project may afford educational authorities access to a powerful integrated data infrastructure and analytic expertise.

- **Anti-fraud protection** by recording encrypted meta-data about all issued credentials in a global decentralized database, which serves as a single source of truth when it comes to inquiries/background checks, etc.

For all of the above-mentioned insights, I provide links to relevant video content by industry experts. The list is not exclusive (in fact it is not limited to universities - it applies to schools and other education providers), but it reflects on my observations from my recent participation at UK's biggest edtech event – “Bett Show 2018”, where I was able to meet with key stakeholders from the field of education and exchange ideas.⁸⁴

Image 8. Lecture of “FutureLearn” on what is next for open learning during “Bett 2018”.



Source: Project archive. (London, 2018)

⁸⁴ The edtech industry covers a wide scope of use cases. The integration of technology does not end with the delivery of lessons to students: online forums help teachers share lesson plans; social media help students collaborate across classrooms, and web-based applications assist teachers in customizing the learning experience for each student to achieve more significant learning outcomes. Early adopters of these educational technologies have demonstrated their potential to transform the educational process, but they have also called attention to possible challenges. In particular, the information sharing, web-hosting, and telecommunication innovations that have enabled these new education technologies to raise questions about how best to protect student privacy during their use. The blockchain technology has the potential to help the existing edtech offering tackle these challenges.

5 Reasons Why Blockchain is The Right Technology for EdTech

At LinkedIn.com, Jordan Jambazov, OS.UNIVERSITY Technology Lead.

The below is a short LinkedIn article, written on the personal blog of OS.UNIVERSITY's technology lead, Jordan Jambazov, coming in response to the many questions received throughout the time around "Why Blockchain?".

I am Jordan Jambazov and I am the technology lead of the Open Source University project. I would like to tell you why blockchain is the right technology for building World's First Academic and Career Development ledger.

- **Reason 1 - Authenticity.** Blockchain is the right technology to immutably store people's education, certification and achievements. We see this issue greatly compounding in the future as more data is being generated.
- **Reason 2 - Decentralizing Trust.** Businesses are driven by trust, and storing data in a traceable manner is essential for the Open Source University project. We foresee a distributed clearing system for education.
- **Reason 3 - Less Bureaucratic.** Storing transactional data on an open decentralized platform is the way we eliminate bureaucracy in education. Even when there is will today, governments and educational institutions use labor-intensive manual processes of transcript request, evaluation, and entry. This occurs on a per institutional basis and is not scalable.
- **Reason 4 - Direct interaction.** Using blockchain businesses, learners & educators will be able to directly interact, without the need of a verified 3rd party. Organizations today spend a considerable amount of time and money setting up and managing traditional data exchanges, requiring resources (or intermediaries) to update field parameters continuously, perform backup and recovery measures and generate information for reporting purposes.
- **Reason 5 - Security.** Blockchain is secure, and you would rather store your achievements in a secure way. A vast majority of educational systems cannot easily (or safely) share their data. As a result, educators spend more time typing and updating systems, opposed to focusing on educating students.

We use blockchain in order to transform the basic pillars of our society - education and its interaction with businesses.

**Ask Me Anything (AMA) Session on the Future of Blockchain
Beyond Fintech - Projects, Industries, Value, Trends**

At AMAfeed.com, Hristian Daskalov, OS.UNIVERSITY Project Lead.

Blockchain technologies have a huge disruptive potential, but also a lot of hype and speculation is going on around them. If you want to start, join or invest in a blockchain project, you may be wondering which projects in which industries provide what value, at what cost, what is the speed of change and the future they create in a particular field. The below is an extract from what turned out to be a very popular “CryptoAMA” online event that was held in February 2017 in order to provide clarity on the subject, leveraging the experience and the ideas that OS.UNIVERSITY team has to offer.

Q. What would you say is the biggest benefit or advantage about being knowledgeable in area of blockchain?

- In my case, it is the opportunity to create around the technology, and share the results of my work with an open-minded community, eager to explore new blockchain applications. Check some of my presentations at Slide Share⁸⁵ to see where my creative work is focused and have a look at OS.UNIVERSITY's white paper. Making this project happen is by far the biggest advantage, both personally and socially.

Q. What is the most challenging thing about being in the blockchain industry?

- I believe that the most challenging thing is to explain the broader application of the blockchain technology, e.g. smart contracts, beyond cryptocurrencies. Blockchain for business has huge potential, though I work on blockchain for education mainly. Check out what the guys from Linux, IBM, and many others, are doing with the Hyperledger project – it is amazing!

Q. Do you believe that even those who do not use or own crypto-based currencies or other blockchain-related projects should still be aware just because it is the ‘future’?

⁸⁵ Link available at: www.slideshare.net/Daskalov.

- I believe everyone should be up-to-date with the most popular technologies out there, no matter if he/she uses them; likes them or not, etc. This is ultra important in today's fast-changing economy. DLT (distributed ledger technology), together with AI/ML, IoT, among others, are to redefine many industries the way the Internet did it, they way smartphones did it, etc. Beyond the immediate necessity, if one wants to be ahead of the curve, awareness of the future trends is a must. As an example, let's take the field I am passionate about - innovating and democratizing education.
- Blockchain-solutions are not the obvious first choice in the educational technology sector. I just came back from UK's biggest edtech conference and in fact VR (virtual reality) was all over the place - hardware, software, services.
- However, if you dig deeper (beyond the hot-gadgets of the day), you will see how the brightest educational innovators (e.g. Learning is Earning 2026 initiative) are foreseeing "The Ledger" as the cornerstone of the educational world in 10 years. What they foresee in 2026, we at OS.UNIVERSITY have been working on building for more than 2 years now and will launch in 2018.
- In a nutshell, the applications of crypto today are not more than 1% of those in 5-15 years from now and you need to ask yourself what's next.

Q. I would like to know your thoughts on blockchain disrupting the academic journal publications system. At the moment, the system is very centralized (a few big companies own many of the most "reputable" journals) and the creators of content, i.e. the academics, are the ones paying for the 'privilege' of being published in these journals.

- The blockchain definitely has the power to disrupt the academic journal publishing market. There are researchers currently working in Germany around that, but the OS.UNIVERSITY project team has the potential to contribute to solving the problem (it is in our R&D roadmap).
- Let's get in touch, join our efforts! Your expertise and insights as an academic will be highly appreciated in order to dig deeper into this use-case of which I am very passionate as well. No need for tech. skills, just bring with yourself the good old research curiosity.

Flash Interview with OS.UNIVERSITY Team

At ICOholder.com, online listing portal extract.

The below is a brief interview with representatives of the OS.UNIVERSITY team on how they plan to achieve their goals in 2018. It was originally published by the “ICO Holder”, an online portal for expert analyses and assessments, which scored the pre-sale phase of the project highly, praising it for its team, potential, activity and vision.

The Open Source University R&D team promises to revolutionize the way businesses, learners and educators communicate with each other, using open blockchain technologies.

Image 9. *A moment from OS.Uni work process (daily standup) at the headquarters in Sofia.*



Source: Project archive. (Sofia, 2017)

According to the team, the blockchain shall bring trust and traceability of all certificates and degrees, issued by universities and other learning providers, enabling businesses to benefit from matching with the right candidates while excluding third parties, saving time, money and fixing most of the current scalability issues they are facing.

Q. What differentiate you from the rest of the ICO projects out there?

Hristian Daskalov, Project Lead:

- In contrast to the vast sea of wannabe-disruptor ICO campaigns, OS.UNIVERSITY project is unique in the sense of having already been recognized by industry-leaders such as Hewlett Packard Enterprise, Ernst & Young, AIESEC, The European Commission. We are named as one of the top ten social innovation ideas worldwide, as part of “Living Progress Challenge 2016”, addressing the global development goals of the United Nations in the field of education and professional development. Our platform will enable billions to find, organize and validate their learning accomplishments beyond institutional and national borders.

Q. We see that the blockchain is being applied in numerous different areas and use-cases. What problem are you solving?

Jordan Jambazov, Technology Lead:

- My opinion about Open Source University is that it is one of the few blockchain projects that actually make sense—bringing people certification to the blockchain and connecting learners & businesses through smart contracts has the potential to revolutionize the learning and development markets.

Q. Which are your users and customers?

Dobromir Kovachev, Senior Blockchain Developer:

- Open Source University project is a real game changer, because it is the first solution, which will connect academies, businesses and students in such a transparent and way. On one side, businesses will have instant access to infinite pool of new talents, targeted by specific skill requirements and with proven records of accomplishments, verified by authorized academic organizations.
- On the other hand, learners will be more motivated, knowing that during their education they can be reached by businesses, which are offering them unique professional opportunities and personal development. In a few words our project is extremely scalable and has huge goals to pursue—it will take its time to achieve its mission, but it has already been recognized by numerous businesses and academies, which are waiting to integrate the platform in 2018.

OS UNI and its Stakeholders - Academia, Learners and Business

At ICO Investments, Christine Marshall, Jan. 5th 2018.

Nowadays, more than 3.16 billion users of the internet with different ages, particularly youngsters, backgrounds, and cultures are looking for a technology based way of learning through which they can progress, develop, and become successful in life.

In spite of being a part of the modern era, the campus programs of education having tenure of 4 to 5 years are turning into inconvenient solutions, especially in the field of information technology where young people get employed before completing their education where they are forced to make a choice between their job and studies.

There are more than 50 online platforms that provide free education through the content that is available on the network of already established universities. The main reason behind starting education platforms, such as EdX, Udemy, and Coursera, is to give a chance to the original content creators, like individuals, colleges, and private institutions to develop a connection with the educators where they can get enrolled into various courses.

The crypto revolution that is taking place currently has the power to disrupt the existing system of education by making learning affordable and advantageous through the removal of third party requirements. The Open Source University offers a remarkable Blockchain-based system of providing education to students. Smart contracts, decentralization, and cryptocurrency are some of the new concepts introduced in the market and are essential for meeting ever-changing demands of businesses.

In order to understand better the components of this blockchain-based education platform, it is important to know about the parties involved in it, that is businesses, Academia, and learners. Business here refers to all the medium, small, and large enterprises operating in the fields of automotive, healthcare, construction, and science and technology.

The second party involved in this model of education is learners, which includes students and people that are trying to attain specialization in a particular field. Plus, it also includes people who are looking for challenges in professional lines.

The third party involved in the Open Source University is Academia, which consists of universities, MOOC platforms, training and development providers, high schools. The Open Source University has been created to form a direct connection between these three parties and such connections are named as learners to academy, business to academy, and business to learners.

All these three platforms can get a lot of benefits from this education platform based on Ethereum Blockchain. Enterprises get the benefit of acquiring a skilled labor force and fulfill its learning and development needs in a distributed way.

Academies get the advantage from scaling its audience. Moreover, they gain a competitive edge through automation and advancement of its operation together with customized experience of education. The OS University has changed the traditional system of recruitment.

Learners obtain the benefit of good quality education. They also get a chance to directly approach recruiters that are seeking for candidates having a suitable profile. If you are looking for more information, then read the white paper⁸⁶ of the OS.UNIVERSITY project.

Image 10. OS.Uni uses actively London's blockchain and edtech scenes to promote its brand.



Source: Project archive. (London, 2018)

⁸⁶ Available at: <https://os.university/static/open-source-university-edu-whitepaper.pdf>.

Blockchain in Education

At “The EdTech Podcast”, Sophie Bailey, March. 15th 2018.

Sophie Bailey is an active edtech blogger, writing for a wide range of subjects, among which assessment, cloud & LMS, coding, making & digital skills, data & backend, government/NGO, higher education, HR tech & lifelong learning, MOOCs, publishing & content, start up.

I have recently embarked on Masterly’s Blockchain course to get to know this distributed ledger technology better. It has been a fascinating experience so far and I’ve connected with some fantastic people as a result. Here is my week 1 attempt to explain the technology itself (recorded whilst I was half asleep at SXSWEDU)⁸⁷. Our “homework” this week was to identify a use case for blockchain. Of course, I chose blockchain in education. Specifically, I came across the company Open Source University from Bulgaria. I thought I would share my thoughts below on where I think Blockchain will make a difference and where it may repeat past processes. I would love to know your thoughts...

- **What’s the use case and what problems does it solve?**

The use case for blockchain in education is largely around using the distributed ledger system to provide an immutable and searchable record of learner achievement. This becomes especially interesting when credentials can now be achieved through a variety of non-traditional players including MOOCs, coding bootcamps, and apprenticeships. There is also a great deal of inefficiency around discovery along learner pathways from students looking for University places to recruiters looking for relevant employees. The current system is predicated on expensive third party intermediaries and trust. The traditional CV is partially shifted online through services like LinkedIN, but still relies on personal references to validate information. As fake profiles show, it is still possible to give fraudulent information

The Open Source University project was conceptualized in 2015 by Hristian Daskalov, a former R&D strategy advisor to the Ministry of Economy in Bulgaria. It originated as a research project at the Faculty of Management within the Technical University of Sofia, and developed into a scientific publication.

⁸⁷ Recording available at author’s blog: <https://thededtechpodcast.com/blockchain-in-education/>.

In 2016, the Open Source University was announced among one of the top 10 social innovation ideas globally, in competition with 400 technology concepts and 130+ project proposals, as part of the Living Progress Challenge of Hewlett Packard Enterprise. Its use case is largely to “provide educational and career history verified by blockchain technology in a transparent and traceable way.” On top of this, it offers a “tokenized” market between companies, Academia and learners and uses algorithms to exclude the middleman”. The tokens offered are called EDU (or EDU-X) tokens. The value proposition of the Open Source University is described as such on their website:

- As a distributed database that enables Academia, learners, and businesses to record and verify educational and professional development credentials. This in turn will enable businesses to locate suitably qualified learners.
- As a global marketplace upon which high quality academic and L&D offerings will be made available, bought and sold with our EDU Token that will enable transactions and will be traded on cryptocurrency exchanges. Starting with the integration of ~700 of world’s top universities and 60+ million MOOC learners, our blockchain-based platform is introducing the concept of the “Distributed University” – one that enables transferability of knowledge & skills throughout institutional and national borders, reduces operational costs and opens up the access to high quality education and career development opportunities to hundreds of millions.

The problem of the mismatch between the various stakeholders – learners, educational providers and businesses – is well documented. As the OS Project identifies, Sony Global Education and the Open University are already working on their own versions of a blockchain enabled educational offering. Companies like “Full Fabric”⁸⁸ and “BridgeU”⁸⁹ are working to improve matching of students to Universities and companies like “Pymetrics”⁹⁰ and “WhiteHat”⁹¹ are working to place graduates and apprentices into the world of work. The prohibitive cost of University is also seeing alternate edu players pop up and gain traction, everything from “Open Classroom”, “EdX” and subsequent accrediting

⁸⁸ For more information, visit: <https://fullfabric.com/>.

⁸⁹ For more information, visit: <https://bridge-u.com/>.

⁹⁰ For more information, visit: <https://www.pymetrics.com/>.

⁹¹ For more information, visit: <https://whitehat.org.uk/>.

services to support – whether that’s open badges or projects like “Skills Fund”⁹². But the interim world is very disparate – there is not yet one player able to pull everything together, though “LinkedIn”⁹³ is trying very hard and has the advantage of established data in this field.

- **Who’s it for?**

Open Source University is for Businesses, Learners and Academia. Essentially,

1. **Business:** Identify and contact qualified talent at low cost and keep track of internal talent development
2. **Learners:** Control their own record of learner achievement and access all learning achievements, payable through EDU tokens
3. **Academia:** Huge cost-saving on recruiting students and offer new business models for accessing their content

- **Why is it important?**

The current higher education model is (purposefully) limited because of prohibitive barriers to entry including cost. Degree courses are not always agile enough to provide learners and workplaces with the skill sets they need. As such, a move towards shorter form courses – and a need to substantiate this time of course through new forms of credentialing – is something currently being discussed by everyone from the Office for Students to the Confederation of British Industry. The player or players that are able to create trust in a new form of learner recognition *may* become as important as the traditional University names. More importantly, this shift may mean a better experience for the learners and for employers than the current offering.

- **Why will it success or why will it fail?**

Crucially, the main issue with this model is it may be solving the wrong problem. As someone I spoke to recently said, “How many employers actively check a student’s degree is real”? The real problem comes not in trusting degrees or certificates to be true, but in the *value* of degrees, coding bootcamps and MOOCs. Take “Powerledger” and using blockchain for the trusted sale and distribution of energy across individual suppliers. This is possible because there

⁹² For more information, visit: <https://skills.fund/>.

⁹³ For more information, visit: <https://paragonpr.com/linkedin-microsoft-strategic-blockchain-advantage/>.

is an agreed unit of exchange with an agreed value. The education community have not yet agreed an equivalent unit value for modules across differing suppliers. Therefore, the blockchain may be able to show an indisputable record of a learner's achievement, but it does not yet solve the issue of what that combined record is *worth* (outside of the also indisputable internal and personal satisfaction of learning itself).

There is a definite need to broaden access to learning – see success of Coursera, Khan Academy, EdX. The Open Source University has in its favor a reputable developer market and likely high quality technical platform, as well as backing from the national Ministry. The use case in terms of creating an immutable ledger of learner experience is solid, especially in a country with a high degree of coders etc. who may be more likely to be self-taught online or through coding boot camps which need verifying. However, one wonders if the global stage on which we learn, meet and work, will demand a larger player to verify our records? Will the centralization of information that blockchain seeks to avoid, inevitably happen again with, say, LinkedIn running “THE” distributed ledger of learner achievement? Or, the Open University instead of the Open Source University? Then again, we are seeing a localization of learner services again with national MOOC players popping up like India's MOOC platform, Swayam and the Chinese MOOC player XuetangX – a trend identified by Class Central.

Could it happen that the local Ministries of Education each have an open and searchable record of learner achievement, in which case Open Source University – with its links to the Ministry – are very well placed? This would have obvious benefits to each country looking to monitor and solve its own “skills crisis”. Outside of who will run the blockchain-enabled ledger or ledgers of learner achievement, which I believe is inevitable and already visible through players such as Blockcert, there is a cultural problem with the current positioning of Open Source University. Its website smacks of Blockchain mania with plenty of hyperbole including “Revolutionizing the way 7 billion people develop academically and grow professionally”. Those who work in education will know it is an evolutionary and cautious beast.

Open Source University currently speaks to the technology and business community and less to the educational institutions, which it will need to collaborate with on some level in order to be successful.

- **Is there room for an ICO?**

This brings me on to the token sale. The Open Source University states “The more the OS.UNIVERSITY marketplace scales in a global trillion-dollar market, the more its EDU token value will rise, hence the current offer to acquire your tokens through our ICO, starting in November 2017.” The cultural fit of “EDU tokens” within the traditional education marketplace is of concern, but more so how interoperable, stable and valued these tokens will be outside of Bulgaria alone? The tokens are primarily to generate finance for the project, as opposed to an improvement for the learner experience.

- **Conclusion**

I believe there is a need for an immutable ledger of learner achievement. Who provides this and whether it becomes simply the new gatekeeper of educational achievement, replete with cost to entry and fragmentation issues is still to be seen. The other use cases of the Open Source University – to use algorithms to better match learners and courses and graduates and employees – do not rely on blockchain technology, though their success rate may be improved by a trusted and large database of achievement. However, many companies are already using algorithms in this way to improve the current status quo which is riddled with high costs and inefficiencies. Whilst an aggregate and immutable picture of achievement will be useful, it also remains that a person’s ability to do something is one thing, their ability to do that thing in a personable way and as part of a team is another. As such, the usual trusted personal reference and face-to-face meeting will still retain lots of value within this system.

I expect to see lots of national/domestic focusing educational blockchain systems of records of achievement, with a few dominant players globally. So gatekeepers will remain and the larger problem of establish the value of various educational offerings still remains too. The idea of smart contracts is interesting, however. When we start to think how student loans companies manage to overcharge students who have finished paying their fees a smart contract could end this; conversely, an educational course supplier could be “paid” through a smart contract once an employee finds their first role. This could all happen already (and sometimes does), so it is largely systems thinking which needs changing. So, blockchain solves one problem, but the larger problem still exists: how do we value varying educational opportunities?

These Innovative Startups Take Education to the Next Level

At “Observer”, Tomas Laurinavicius, Jan. 30th 2018.

Tomas Laurinavicius is a traveling lifestyle entrepreneur and blogger from Lithuania, writing for Observer.com, a leading online technology journal.

Gamified learning, apps that let you study on your phone, blockchain-based edtech companies, personalized learning, teaching robots... the list goes on.

You have most likely heard of and experienced some of the new-age edtech products first-hand. So let me state the obvious here – the edtech ecosystem spans much more than just apps for schools and teachers. Corporate learning, personal learning and hybrid education technology are all part of the edtech definition. With investments picking up in the sector and a recent avalanche of new edtech companies pouring onto the scene, the industry has blossomed into a multi-billion market⁹⁴.

We have already seen the speed of adoption of online learning⁹⁵, with platforms like Coursera and SkillShare counting their students in millions, and witnessed the booming popularity of MOOCs (massive open online courses). While so much noise in the market almost always means that some new companies will fail, those that manage to cut through the buzz will lead the disruption. Here are five innovative education startups that are poised to make waves in the edtech industry.

▪ **BitDegree**

BitDegree is the world’s first blockchain-powered online education platform that offers token scholarships and simplifies tech talent acquisition. The fact that it’s built atop of Ethereum, the new revolutionary blockchain technology, allows BitDegree to issue their own tokens that can be exchanged amongst the users of the platform – students, sponsors, and third parties. The beauty of digital tokens is that they can represent almost any asset that is trade-able and fungible, from commodities to loyalty points, and in the case of BitDegree, they represent payment for a scholarship.

How BitDegree works is brilliantly simple. A company can sponsor (hence, the sponsor) an online course in the hope of identifying and attracting the emerging

⁹⁴ Data at: <https://www.theatlantic.com/education/archive/2015/11/quantifying-classroom-tech-market/414244/>.

⁹⁵ Data at: https://www.researchandmarkets.com/research/qgq5vf/global_elearning.

tech talent. A student can undertake an online course for free and get rewarded for their achievements as they work their way through the course materials, with the bonus of a potential job offer from the sponsor at the end of the course. The BitDegree educational model addresses some of the hottest industry issues. It helps students pick up new, in-demand skills that make them more employable, while, at the same time, helping businesses source the right talent. The gap between what universities teach and what employers want closes significantly, and this sort of incentivized, demand-driven learning is the future of education.

- **Happy Numbers**

Happy Numbers is a math app for children that successfully blends pedagogy, research and technology. It's engineered to assist teachers in fostering independence through immediate feedback and remediation for errors, adaptive scoring, individualized pacing, visual modeling, and support for non-readers.

The team behind Happy Numbers have neatly packaged some of the best, time-tested approaches to math instruction and enhanced it with emerging tech solutions to help children, as young as 4 years-old, to grasp and master math skills. The shift towards an algorithm-driven world has put math knowledge at the top of everyone's learning agenda, and if technology could be used to simplify and streamline this process, then Happy Numbers are already testing its capabilities.

- **Rype**

Rype is the most effective way for busy people to learn new languages. Speaking a new language is one of the most popular items on everyone's learning wish list, and it's also one that gets postponed, pushed aside and overlooked most of the time. Mastering a new language takes time and practice – or at least that is what we're used to thinking.

The Rype app is determined to change that perception by offering a fun, powerful and research-backed learning solution that combines quality teachers, convenient learning, and simple pricing. The backbone of the Rype teaching method is to have students immerse themselves in the new language on a daily basis. As a paying member, you can book private lessons with fully vetted, 5-star rated teachers any time of the day, anywhere in the world. A student also gets a personalized learning program, which is designed to address their knowledge gaps and enable them to pick up language skills much faster.

- **Open Source University**

OS.UNIVERSITY is a tokenized learning and development marketplace built on the blockchain technology. It strives to use blockchain technology to make all academic achievements transparent and to offer an industry-standard digital wallet to store academic certifications. For certifications to be useful, they must be universally recognized and verifiable, however, it is still very much a manual job in the education sector. OS University plans to change that in the nearest future.

The platform effortlessly connects businesses, students and educators by using smart contracts. It is particularly convenient for students who are trying to find the right academic and career development opportunities. A matching algorithm handles big data calculations to connect businesses with the right candidates, simplifying the recruitment process and significantly cutting down costs.

This Ethereum project⁹⁶ aims to revolutionize the way businesses, learners and educators communicate, eliminating the intermediary and making the tracking of learning records a simple, real-time process.

- **Brainscape**

Brainscape⁹⁷ is an online flashcards app that applies decades of cognitive science research to make studying as efficient as humanly possible. It allows users to either create their own flashcards, study Brainscape’s “knowledge rehab” flashcards or immerse themselves in classes created by fellow users. Learning topics can range from World History to Trigonometry to Salesforce, bringing modern students up to speed with the most important facts and lessons.

Brainscape stands out from the scores of other edtech apps thanks to its scientifically proven adaptive flashcards algorithm that repeats concepts in a pattern that is optimized to the user’s pace of learning. The app is committed to combining the latest cognitive science research on the patterns of repetition, color, font style, social interactions, breaks, sounds, humor, animations, achievements, and rewards to develop a learning experience that improves our brain’s speed of learning.

⁹⁶ While OS.UNIVERSITY steps on top of Ethereum, it is not correct to call it an Ethereum project – the team seeks integration with broader range of blockchains in order to create a multi-chain solution.

⁹⁷ Available at: www.brainscape.com.

Hacking the Job Market

At “*Blokt*”, Pete Banham, March 6th 2018.

Pete Banham writes for “Blokt”, a leading blockchain news media, aiming to become the ultimate cryptocurrency and blockchain authority resource, dedicated to unbiased news and the most useful repertoire of blockchain tools.

Tuition fees, fierce competition amongst peers and simple access to social media have created a growing challenge for both universities and employers. With *more than fifty percent* of polled employers claiming to have caught *lies on their resume*⁹⁸ and *1 in 3* purported to have *explicitly lied about their education*⁹⁹, it’s becoming increasingly important for organizations to spot and weed out early what could adequately be described as *job hacking*.

38% of recruiters said they had removed applicants from consideration after discovering false information. However, this is still a time consuming and expensive process for the hiring manager and doesn’t help any recruitment consultant relationships. This cost of resume fraud doesn’t just hit the business community. Universities in the UK lost over £2m to cover the cost of requests to verify alumni qualifications. The rising cost of gaining higher education is increasingly justifying the risk for many. Combine this with a highly competitive labor market for the more desirable positions is likely to make degree fraud more widespread.

Not only is it easy to type a few lines pertaining to a Computer Science degree, but it can also push you up the corporate ladder, although not everyone comes out unscathed. A case in point would be *ex-Yahoo CEO Scott Thompson*, who claimed he had such a computer science degree, only to be exposed by an activist investor. Had he not reached such a high office, would that same investor have pursued his agenda with such vigor? How can businesses and educational institutions better protect their interests and those of genuine, hardworking students? There may be an answer sitting out there in cyberspace in the form of the blockchain.

“Isn’t the Blockchain something to do with Bitcoin and cyber criminals?” Not quite. Blockchain has many useful applications, some of which are only just

⁹⁸ Source: www.careerbuilder.com/share/aboutus/pressreleasesdetail.aspx?sd=8%2F7%2F2014&id=pr837&ed=12%2F31%2F2014.

⁹⁹ Source: ww.roberthalf.com/blog/evaluating-job-candidates/lying-on-resumes-becoming-more-common.

starting to emerge. A blockchain is effectively an immutable database, shared across the internet and maintained by many participants. Its key strength lies in how records are written, using a ‘trustless’ model that provides protection from attack and corruption. It lends itself as a useful technology where 3rd party trust, availability, and immutability are valuable. So you can easily see how Bitcoin and other cryptocurrency ideas have become so popular. I have a coin (unique digital token), I transfer that coin to another party in an exchange using a highly available system, and that transaction is recorded in an immutable form, preventing fraud. No bank (or intermediary) required.

One such organization looking to tackle this head on is an innovative startup Blockchain company, Open Source University. When speaking to the Technology Lead, Jordan Jambazov, I quizzed him on what they thought the most prominent issues are and how they could help solve them.

He had the following comments on the main issues:

- ***Firstly, labor productivity.*** *With the quick pace of technological advancement, people and labor market need to support this pace as well. Having educated society definitely helps the labor productivity – both on micro and macro levels.*
- ***Secondly, traceability of achievements.*** *Having traceable achievements is healthy for every business, since it allows for better planning and makes its target more easily predictable. It is good for employees as well, since it makes their achievements visible, which helps to maximize rewards as well.*
- ***Third issue is trust.*** *No business can operate without trust. Traceability and immutability of data on blockchain will contribute in the process of building trust. Of course, that does not exclude good communication.*
- ***Lastly, qualification.*** *In 21st century it is crucial to adapt fast to new changes and learn during you entire lifetime. In that regard, it is important to have a platform, where businesses, educators & learners could directly cooperate and quickly adapt to the changing requirements.*

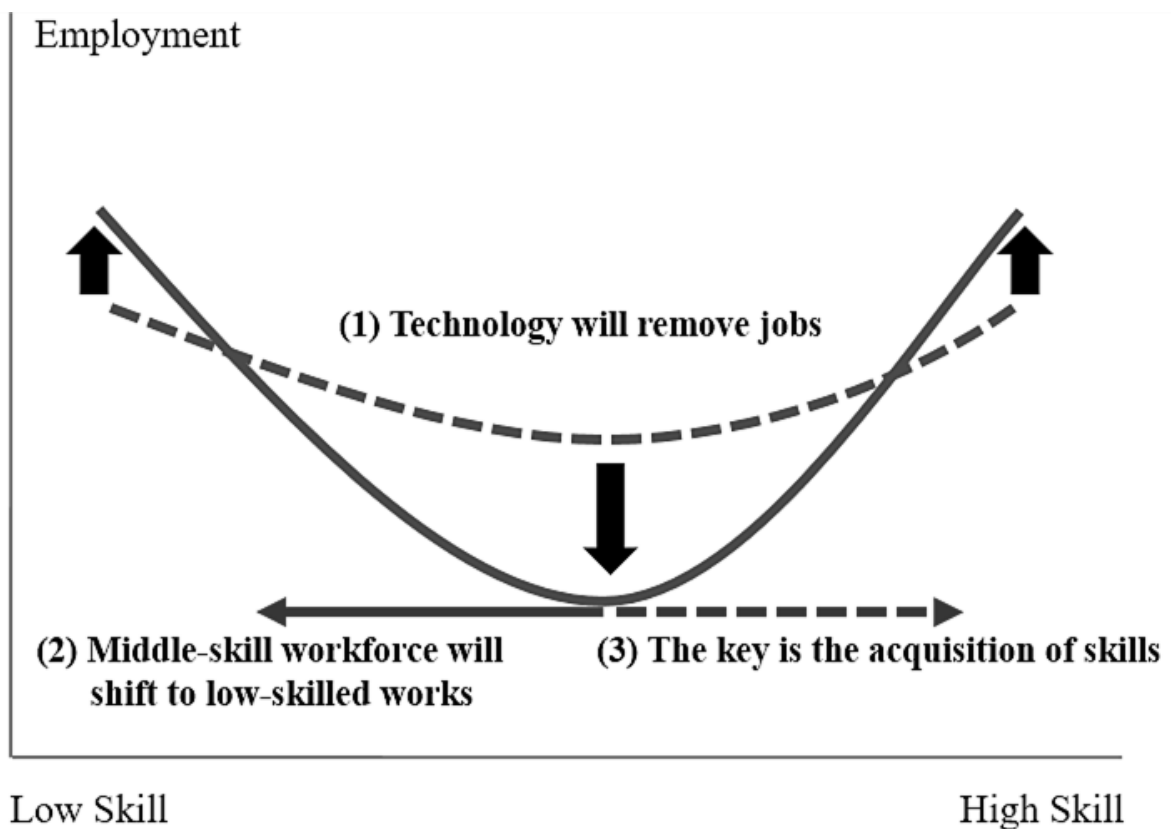
Apply this technology to the challenge facing hiring organizations and we can see an underlying mechanism with benefit. Upon successful completion of a course, students could be assigned unique tokens that represent not only their final

grades, but potentially other information about their academic achievements. This kind of immutable proof can help employers narrow their search and find their ideal applicants from large talent pools, instead of currently requiring an expensive and sometimes long advertising process, that may yield sub-par results or in some cases, be fruitless.

Jordan Jambazov commented on the usefulness of current background checks: *“Maybe they are good enough in some cases, but that’s not the scalable approach. I believe that bringing certification, skills & achievements to a trustworthy system, can save hundreds of thousands of hours.”*

When looking at the stats, he may be right. The combination of a tough job market, increasing tuition fees and widespread acceptance of being able to embellish a resume without getting caught, is likely to produce an increase in fraud. Although job hacking is easy in many cases, the clear-cut case for using blockchain technology is likely to act as a deterrent to some. It should also provide *real long-term value* to educational institutions, business organizations and the hard-working individuals themselves.

Figure 2. Visualization of change of employment type due to the Fourth Industrial Revolution.



Source: Park, Society of Open Innovation. (Riga, 2017)

Below is a full transcript of the interview, conducted with OS.University team in the process of drafting the article:

▪ ***What are the current biggest issues you see with the labor market?***

Recently students and academicians at the London School of Economics pointed out that the issues at the labor market, or the future of work in general, poses greater challenge to society even when compared to areas such as environmental sustainability. We at OS.University took part in the discussions at LSE and can state that globalization, combined with rapid technology advancement, will make the labor market ever more volatile, unpredictable, and unimaginable when it comes to training the workforce 5-10 years in advance.

Therefore the need to bring the learning and development processes beyond institutional and national borders so they are as flexible and agile as possible. And the need to re-inforce trust in each other's digital identities without intermediation, so that hiring can become faster, truly global.

▪ ***Why do you think current background checks that employers run are not sufficient?***

Maybe they are good enough in some cases, but that is not the scalable approach. I believe that bringing certification, skills & achievements to a trustworthy system, can save hundreds of thousands of hours. Different researches show that over a month and hundreds if not thousands of dollars are being spent on verifying candidate's credentials at present.

Instead of relying to a third party, the blockchain as a distributed database is what will create trust at zero cost. We are speaking about a fundamental change around how digital identity is being perceived - the cost savings are purely a fraction of the disintermediation benefits that will occur.

▪ ***What are the biggest misconceptions about current background checks employers run?***

I would say that the biggest misconception is that it is a process applicable only to large organizations. Making the process more lightweight will make it attractive to startups as well, IMO. If we go beyond employers, the needs and use-cases grow. Industry organizations, international certification bodies, they would all benefit from the presence of a global L&D ledger.

Speaking of governments, they currently go through a very slow and painful process of reviewing learners' accomplishments every time a bachelor student wants to do his masters abroad. In EU-countries, such as Bulgaria, this may take up to 6 months for a learner from abroad. Recording the information, regarding the diplomas being issued onto the blockchain, brings this time down to minutes.

- ***What does OS.University do to address the problems above?***

OS.University addresses all the projects addressed above: education, traceability, trust, qualification, visibility - everything is solved by the OS.University platform, built on top of blockchain. We go far beyond making background checks leaner. We enable huge percentage of the global population to organize its learning and professional development needs in a decentralized manner.

Let us take higher education for example, leaving the recruitment industry aside. Speaking of academic learning, less than 50% of U.K. citizens and less than 20% of those living in countries such as India and Brazil have access to university education. The ones who are excluded, we are empowering to curate their studies and receive the recognition they deserve. This is what makes them employable, opening the doors to a job interview. To hire the right candidate, you need to have it already prepared, right.

- ***How quickly would employers see benefit in using OS.University?***

As soon as they hire the first candidate through the platform & they make sure their skills are genuine. Next to the hiring benefits, there is the learning and development element. OS.University as a system will be able to help with reskilling and upskilling employees as of day one by providing employers with a tool to organize "crowdsourced" or 'distributed learning curricula and employees with a mechanism to record their achievements in an indisputable manner, i.e. without the need for a centralized educational authority standing in between.

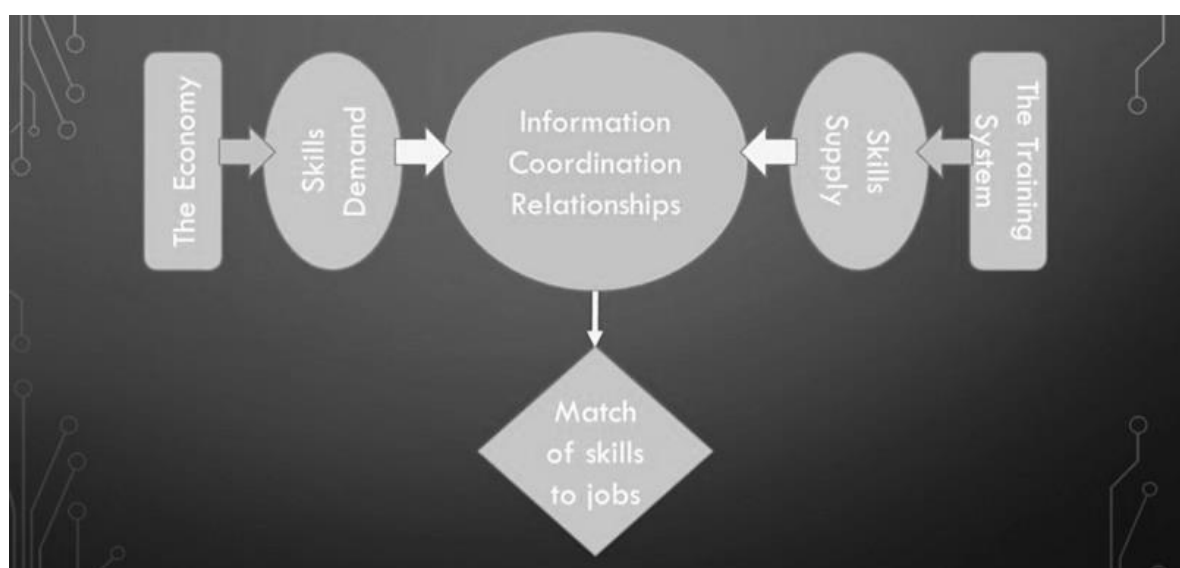
In the past, corporation have also struggled with migration of their data to the cloud, due to not being able to ensure the security of personable identifiable information, classified, and other sensitive data. Due to the defragmented and decentralized nature of blockchain technology, storing data on the Blockchain, regarding the career progress of their employees, will alleviate the security concerns of storing data in a third-party cloud.

CHAPTER 3. COMMUNITY UPDATES

As mentioned earlier, in May 2017, I took part in the ‘Youth Speak Forum’, organized by world’s largest students-led organization AIESEC and their partners from world’s leading consultancy “EY”. Together with an international team of students from the Baltics, I worked on designing a scaled-down prototype of the OS.UNIVERSITY, addressing what the team identified to be a key deficit in the academic process in Latvian universities. The deficit itself— lack of close to real life case studies as a mechanism to connect students, Academia, and businesses in meaningful learning experiences by providing a way for companies to benefit from student-led open innovation solutions, which are being developed in collaboration throughout the course of studies.

While the prototype concept (titled “SolveIt”) and developed under the supervision of EY consultancy team (*some of whose clients are the University of Latvia and the Ministry of Education*) was awarded 1st place in competition with other social innovation solutions, the broader OS.UNIVERSITY platform would address not only the deficits, but also the root cause behind them. According to EY, information coordination relationships are what enables the match of skills to jobs, hence the need to address their current quality in order to bridge the gap between business and Academia.

Figure 3. *Functioning of information coordination relationships - schema.*



Source: Own research, adapted from “Ernst & Young”. (2017)

While building the platform to coordinate the much needed closer cooperation, including in terms of submitting, designing and promoting collaborative solutions, is a step in the right direction, its underlying technology is what would separate the successful attempt from yet another high-end ed. tech. solution that fails to deliver on its promises.

Here is where the OS.UNIVERSITY stands out from the crowd, being world's first distributed learning & career development ledger with potential to revolutionize the way 7 billion people develop academically and grow professionally. Based on the Ethereum blockchain, the platform serves two main product functions, which we have already explained, but it is worth summarizing:

1. **As a distributed database** that enables Academia, learners, and businesses to record, verify and showcase educational and professional development achievements, incl. such assigned by businesses.
2. **As a decentralized marketplace** upon which high quality academic and broader L&D offerings will be made available, bought and sold with the help of the EDU token that will enable transactions on the platform.

Only by decentralizing the setup of the platform solution, scalability would be successfully enabled. Because no matter how strong they are, information coordination relationships on micro-level would never be sufficient and resilient enough to address the mismatch on macro-level—something that the decentralized OS.UNIVERSITY platform would be able to solve through the power of big data analytics.

But why do we need to go through platform's vision and mission again? Well, because without clear use-cases in sight, it is difficult to fully comprehend its value. The recognition received by EY in the first half of 2017 does not do the job by itself. What followed is more important – the piloting work on the ground, together with the key stakeholders from the respective communities.

Quality education is one of UN's Sustainable Development Goals (SDGs). As such, AIESEC, which is collaborating with the UN on enabling the successful implementation of these Goals (focusing on Goal 4), gave an invaluable boost to the OS.UNIVERSITY project. It allowed the project to benefit from students' first-hand experiences and consultants' professional insights during the "Youth Speak Forum" and later invited me to take part in a social project in Sao Paulo, Brazil.

During my work in Brazil, the idea to organize regular community updates came to be – there were so many great insights to share! We initiated our first video updates to keep the conversation going. It was about our work on SDG 4 of UN’s list, regarding the need for a substantial increase in the number of youth and adults who have relevant skills (including technical and vocational) for employment, decent jobs and entrepreneurship. Technology and telecommunications advances have dramatically changed the landscape of education - gone are the days when textbooks, photocopies, and filmstrips supplied the entirety of educational content to a classroom full of students. Today’s classrooms increasingly employ on-demand delivery of personalized content, virtual forums for interacting with other students and teachers, and a wealth of interactive technologies that help foster and enhance the learning process. Yet, these opportunities are not distributed equally – this was the message we wanted to spread from the biggest metropolis in the South Hemisphere.

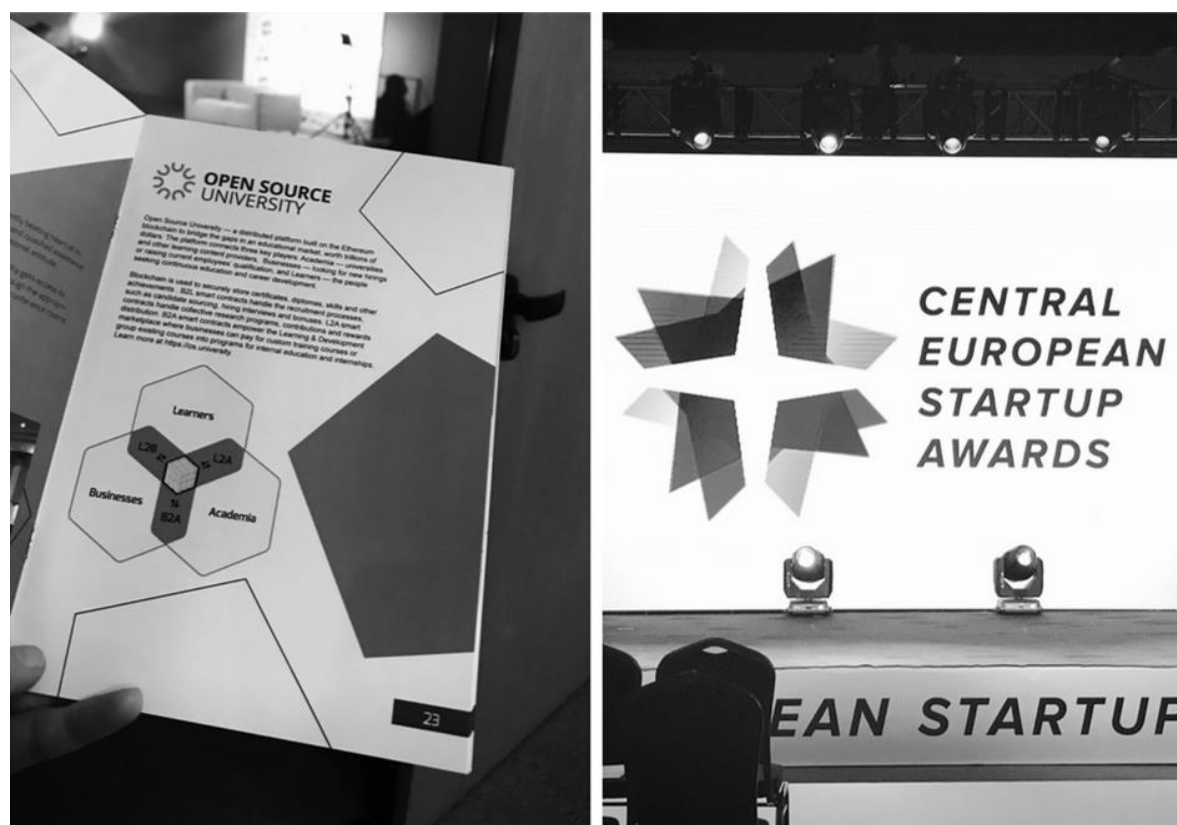
Image 11. Moment from the work on the project at CCInter –Novo Mundo, Sao Paulo.



Source: Project archive. (Sao Paulo, 2017)

Looking back across the time, we should have done more of these video updates to capture and share more of the stories that mattered. As an example, the early meetings we had with our global advisors and ambassadors or the accidental acquaintances, leading to insightful discussions throughout events such as the “Central European Startup Awards”, which we partnered organizing (image 12). Among the others we were invited to attend, we can name the “Education & Business: Revolution” Conference where Mrs. Smilkova from the team spoke.

Image 12. OS.Uni at the Central European Startup Awards ceremony.



Source: Project archive. (Sofia, 2017)

To compensate for the insufficient visuals, I have included the last 3 of our monthly updates prior to the publication of the book in order to get the reader aware of the dynamic atmosphere, surrounding the project.

A story about a project, worth telling, because since 2009 blockchain has gained more widespread use with a variety of new blockchain-enabled businesses and services that are changing the markets. And the educational market is not excluded from the broader picture. As a general rule, blockchain technology is used to share a ledger of transactions across a business network without control by any single entity, therefore the distributed ledger makes it easier to create cost-efficient commercial relationships where virtually anything of value can be tracked (and traded) without requiring a central point of control. The same goes for the fields of education and career development. Why? Well, the technology puts privacy and control of data in the hands of the individual – a great point when it comes to owning your education. Trust and integrity are established without reliance on third-party intermediaries, which is not the current case neither in Academia, nor in recruitment, on-the-job training, professional development, etc.

Monthly Update: December 2017

December 2017 was a strong month for Open Source University. I would like to start this article by wishing you all a healthy and successful 2018! May the new year be full of personal and professional achievements! Me and my colleagues from the OS University team will make sure you can register them on the Ethereum blockchain so that they become immutable and reach all the right people.

Having said that, I would like to briefly outline what we achieved over the last month of 2017 together, as a team behind world's first L&D ledger on the Ethereum blockchain, aimed to empower 7 billion learners to connect to world's top academic education and professional development opportunities:

- On Dec 31 we closed the first phase of a successful private presale of our EDU tokens that will enable the transactions of value on OS University platform. Both institutional and private investors contributed to the campaign, paving the way for a successful crowdsale in Q2 2018.
- Given the opportunity that presented itself, an important decision was made to dedicate a percentage of the EDU tokens for strategic academic and corporate partnerships on the global stage. The details around these partnerships are to be announced over the first half of 2018. Stay tuned and join our Telegram community to learn more!
- On Dec 19 we were awarded by the Minister of Education with a prestigious academic award—"Doctoral Candidate of the Year". This came in recognition of the research excellence demonstrated over 2017 in regards to project's R&D achievements. Special thanks to the National Assembly of the Students' Councils for setting up and inviting us to attend the amazing ceremony at the National Theater in Sofia.
- On Dec 13 our co-branded video with JobTiger & JobTiger Recruitment was published. It is a great story about the opportunities to modernize the L&D world together. We are looking forward to recreate this best practice with other partnering organizations from the OS University ecosystem.
- Throughout the entire month we were receiving a lot of positive feedback from investors, as well as from media. The "Economy" magazine dedicated 2-page article on the project.

Image 13. An extensive article about OS.Uni in Bulgaria's leading economy magazine.



Source: Project archive. (2017)

- A video interview with our technology lead was featured on “Certification Magazine”¹⁰⁰. Independent review of “Bitcoin Exchange Guide” highlighted our EDU tokens as suitable hedge against ETH price volatility. Our Russian community saw us featured in VC.ru.¹⁰¹
- Our team extended with great experts from around the world. Mariya Georgieva, a successful young entrepreneur with vast international experience, took over the role of a Global Ambassadors program lead. Milena Ribarova, a finance and banking area professional, passionate about bringing a bright future for the education, joined the team as well—she had an article of hers posted on our blog.
- Muhammad Haroon—a renowned crypto-community expert and educational change-maker from Pakistan, along with Ivan Alsina Jurnet—an innovative researcher at the Universitat Oberta de Catalunya (UOC) accepted our personal invitations to become ambassadors to the OS University in their respective communities.

¹⁰⁰ Article is available at: <https://certificationmag.com/blockchain/open-source-university-why-blockchain/>.

¹⁰¹ Article is available at: <https://vc.ru/30719-blokcheyn-v-sfere-obrazovaniya>.

In Q1 2018 we will be focusing on the development of an alpha-version of the OS University platform. We believe that after more than 30 months of research, validation, prototyping and community building, the upcoming release will complete the efforts of the team and will enable us to grow product-wise.

Apart from development, in January alone, we will participate in several high-profile events—Sofia’s upcoming seminar “The Legal Chains of Blockchain”¹⁰², “London Blockchain Week” and the biggest edtech conference in UK — “Bett Show 2018”. I hope to see with some of you at these or other events that are in your radar.

Overall, 2017 was an extremely successful year for the Open Source University project. We hope that in 2018 this project will help you and your organizations grow and benefit from the technology innovations behind it.

Image 14. Moment from the “Best Student of the Year 2017” award ceremony.



Source: Project archive. (Sofia, 2017)

Looking forward to updating you on our progress next month! In the meanwhile, the team remains available for any ideas, questions or comments that you may have to share.

¹⁰² Recording is available at: <https://1legal.net/bg/legal-chains-of-blockchain>.

Monthly Update: January 2018

January was a very eventful and productive month for us - we participated in many high-profile events and also were recognized by many major organizations and media. This is exciting news because it pushes us forward with a lot more enthusiasm and determination towards our main goal - the alpha release. We are advancing faster than expected and planning to release it in late March. Stay tuned for updates!

▪ **Events**

Our team members - Jordan, Momchil, Hristian and Vladi - got the wonderful opportunity to attend a few events and conferences – “Legal Chains of Blockchain”, “Bett Show”, “London Blockchain Week 2018”, “Blockchain Connect Conference” and “NEO DevCon”.

○ **Sofia**

Right after New Year’s Eve we took part in “Legal Chains of Blockchain”, discussing the legal and tax issues of cryptocurrencies. We took the occasion to present our project, the legal challenges we have struggled with on the way and about our cryptocurrency, the EDU token.

○ **London**

Our Project Lead, Hristian Daskalov, attended some of the biggest January events in the United Kingdom. He was at “Bett Show”, a popular conference for followers of education technology and “London Blockchain Week”, UK’s leading conference on Blockchain technology and its impact on the industry. Both are events held in London where we received a lot of positive response and widened our reach. At Bett Show we got in touch with many key stakeholders from the field of Academia and exchanged numerous ideas.

○ **San Francisco**

We turn our attention to the USA with “Blockchain Connect” Conference and “NEO Dev Con”. They are blockchain events held in San Francisco which bring together thousands of scientists, entrepreneurs, investors and developers from all around the world. What’s exciting is that NEO DevCon was entirely sponsored by “AdEx”—a successful Bulgarian ICO with a potential for collaboration ahead.

There, we acquainted many blockchain enthusiasts and experts with how we would solve the problem of today’s education and how we would revolutionize it with OS University. We managed to attract a great audience which supports our idea and we formed a lot of significant bonds with many influential figures.

Image 15. Jordan (CTO) and Momchil (CDO) at a work visit in the Silicon Valley.



Source: Project archive. (San Francisco, 2017)

We got a lot of positive feedback and to top it all we got in touch with many potential partners from Asian countries. We hope to soon expand our audience and project across the Asian markets and collaborate towards a better future for the world’s education.

- **Media Coverage**

Apart from all the events, we also got the exciting opportunity to be recognized by “Observer” among the TOP 5 Edtech start-ups which would disrupt education and the learning industry. We also got recognized by “Disruptor Daily”¹⁰³ as a platform which would innovate the world of education by filling the gap between traditional classroom-based education and its online counterparts.

¹⁰³ Article is available at: <https://www.disruptordaily.com/top-10-icos-disrupting-education-learning-industry/>.

- **Listings**

“ICO Market Data” did not miss the opportunity to rate OS University and gave us an astonishing 5/5 rating! They acknowledged our market potential as *exceptional* and our team as *solid* and *committed*.

Image 16. Top ratings were received by the majority of portals, open for listing and reviews.



Source: Project archive. (2017)

- **Advisors & Global Ambassadors**

Apart from the wide recognition we have been receiving, we also expanded the team with high-profile and highly experienced experts. We welcome Borislav Iliev on our team as an official advisor! Borislav works as a project and media manager in a marketing and consulting company for crypto projects, ICOs, startups and many more. With the expansion of the project on a global stage, our team is expanding as well. Our global ambassadors are proven professionals, experts in their field, who are joining us to be OS University representatives on-the-ground—in their respective universities, industries, communities, including some with a solid background in Blockchain exchanges.

- **Community**

The OS University community has grown a lot for a month! At the end of January, our Twitter account has 500+ followers. Our Telegram community has also gained around 200 newcomers for a month. We are pleased to see that people are interested in what we are doing!

Monthly Update: February 2018

We are happy to announce that right at the beginning of February we welcomed a new advisor on the team, attended educational and tech events and received wide recognition.

▪ Team

OS University is happy to welcome Aly Madhavji as our Senior Strategy Advisor! Aly Madhavji is the Founder and Former CEO of Global DCX, an innovative technology company launching secure digital currency exchanges across the globe starting in India. He is also an avid investor in early stage companies, digital currencies, and Initial Coin Offerings (ICOs).

▪ Events

We had the great opportunity to attend important local and international events such as “HR Industry 2018”, “University-Business Forum Sofia”, “Educational Symposium” at the House of Commons and London School of Economics Science Festival. “HR Industry 2018” helped us reach out to recruiters and we got them familiar with the benefits of our project. Many were very impressed and left a lot of positive feedback about our mission to provide instant access to a global pool of talent with traceable credentials, enabling smarter recruitment.

Image 17. OS.Uni team with the largest business-to-business HR service providers.



Source: Project archive. (Sofia, 2017)

Next we were present at the “University - Business Forum Sofia” which is part of the European Commission initiative to support closer and better cooperation between higher education and business in the EU.

On Feb 28, a special “Education Symposium” was hosted by Mike Kane MP, Shadow Minister for Schools, for Manchester Metropolitan University at the House of Commons. The aim was to stimulate a national debate on teacher education policy with academics, legislators and stakeholders in the education sector.

Open Source University was present at the symposium, given the opportunity for the platform to provide distributed learning programs with credentials verified through blockchain. Such programs would help the teachers’ professional education, upskilling and reskilling, given the flexibility they will provide, and the opportunities for professional development on a global scale.

Not only that, but OS University’s project lead was a guest at the annual “*Science Festival at the London School of Economics and Political Science*”, dedicated to the work of the former LSE Director William Beveridge.

LSE offered a series of academic discussions to shed light on the “Five Giants” identified in the Beveridge report of 1942, re-cast for the 21st century and for the global context. Originally described as Want, Disease, Ignorance, Squalor and Idleness, today’s ‘social giants’ are framed as the challenges of poverty; health and social care; education and skills; housing and urbanization; and the future of work.

- **Community**

We have opened a Telegram Bounty on February which finished successfully and our community has significantly grown. To top it all, our Telegram Airdrop will be announced in a few days so stay tuned for updates!

- **Listings**

Apart from finally being listed on “ICO Holder”, “ICO Bench” confirmed that our project is going to have a great impact on education, by giving us an impressive rating of 4.9! We are more than happy to receive almost 30 reviews from many experts worldwide worth reading.

- **Media**

OS University received not only a high rating from “ICO Bench”, but also a positive review from “Crypto CatchUp!” They did a very comprehensive explanation of what our project is like and what benefits it offers. Watch the video below.

- **Awards**

OS University project was nominated among “The best IT Projects of 2017” by the Bulgarian Association of Information Technologies (BAIT). The award ceremony took place on Feb. 27 and received amazing recognition and also it was the first tech nomination for the project.

- **What’s Next?**

Stay tuned for many updates from our side. In March alone we are going to attend more events—some of them are “Beta Breakfast”, “Computational Law + Blockchain Festival” and “Cloud and Blockchain Tech Forum” in Sofia and others. Finally yet importantly, our CTO and main blockchain developer will inform the community with the latest updates about the Alpha release of the Core and the website. Stay tuned!

Image 18. A breakfast discussion over the project in Bulgaria’s leading co-working space.



Source: Project archive. (Sofia, 2018)

EPILOGUE

Throughout the book, I introduced to you the OS.UNIVERSITY project in which you are invited to take part. It brings the future of Academia close to what it was initially intended to be and what the term ‘university’ really stands for—a community. Now, more than ever before, we need to take action to re-engineer a thousand years old system. The 4th Industrial Revolution¹⁰⁴ is erasing entire industries, creating instant demand for new skills. In the same time, it takes up to 4 years for a new academic program to move from concept to production. Even when it finally does, millions are being left behind. Higher education coverage in large economies such as India and Brazil (world’s 2nd and 5th most populated nations) is as low as 15%. Where access is distributed broadly, debt is piling up—1.5 trillion dollars in the United States only.¹⁰⁵

It is no wonder that the present model is not sustainable any longer. More than 25,000 higher education institutions are starting to lose relevance, facing competition from hundreds of alternative providers online, while companies are struggling to find a scalable project to organize the ocean of learning opportunities and bridge the gaps in an educational market, worth trillions of dollars. Here is where we come! With the help of the decentralized educational platform, already 3 years in research, recognized as one of world’s top 10 social innovation projects by the “Living Progress Challenge”, we harness the power of the decentralized blockchain to address what “Ernst & Young” found to be “*the main bottleneck in matching skills to jobs*”—information coordination relationships between educators, learners, and businesses.

Through the OS.UNIVERSITY platform:

- Universities and other learning providers populate their offerings into the blockchain, making their knowledge production and marketing scalable.
- Learners record and store progress directly into the blockchain, using smart contracts to verify and display their accomplishments globally.
- Businesses have direct access to the greatest pool of talents possible, while big data analytics enable them to target the right ones, meeting the learning and development needs of their current employees on-demand.

¹⁰⁴ Read: <https://weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond>.

¹⁰⁵ Read: <https://www.forbes.com/sites/zackfriedman/2017/02/21/student-loan-debt-statistics-2017/>.

All transactions along the way are enabled through the EDU/EDU-X¹⁰⁶ token, turning the Open Source University project into worlds' biggest educational marketplace where transactional costs are brought down to zero and geographic, socioeconomic and institutional borders simply don't apply. Starting with 60+ million learners, enrolled in more than 7500 massive open online courses¹⁰⁷, our solution has the potential to reach up to 3.5 billion Internet users across the world. With the blockchain-based OS.UNIVERSITY platform, we are launching on the global stage what academic institutions, such as the Open University U.K., and corporations, such as "Sony Global Education", are already testing out.

To those that every second counts and every development opportunity matters, we send our call to action. Because human capital, despite that it accounts for two thirds of total global wealth, and despite that it is the biggest driver of growth worldwide, is still far below its potential. We can do more, for more. To us, the unfulfilled potential of learners, educators, and businesses is the biggest and most urgent global challenge to address. We want to address it as a team, cooperating through the open source blockchain in a decentralized way, because we believe in what the founder of Linux once said:

"In a real open source world, you have the right to control your own destiny."



¹⁰⁶ The two tags are used as equivalents throughout the book. Final decision on which to use is pending.

¹⁰⁷ Read: <https://www.class-central.com/report/mooc-stats-2016/>.

AFTERWORD

Back in 2016, I wrote an article, *entitled “2017 will be the year of the Sharing Economy 2.0, the Internet of People”*. 18 months later and 5 billion dollars more in funding for Initial Coin Offerings (ICOs), I turned out to be right about my predictions on where technology, society and economy will steer all together.

The team behind OS.UNIVERSITY was fortunate enough to look at the “Distributed Computing 2.0.” revolution that (back then) was yet to boom beyond successful pilot projects such as Bitcoin & Ethereum. And we saw the potential for this revolution to disrupt the learning & development systems by creating a global academic & career development ledger on the Ethereum blockchain, along with a decentralized educational marketplace on top of it.

I deeply believed that 2017 will be the year of the Sharing Economy 2.0, the Internet of People (IoP). My personal experience over the previous year gave me a lot of reasons to believe that would be the case, and I would like to share just a couple of them:

- **It’s sharing as in sharing opportunities, not as in sharing beer.**

It’s claimed that the term “Sharing Economy” originates from the open source movement to refer to peer-to-peer based sharing of access to goods and services. Having said that, it might be good to look to the free & open source software (FOSS) as to how its concept is explained – “free” as in freedom, not as in free beer. The same with sharing.

Collaborative consumption is driven by the demand and the strive to optimize the resources that are in your possession, any spare/productive capacity. It is about the opportunities unveiling with the help of different intermediary platforms, which are basically IT enabled two-sided markets. Sorting out the core principles/drivers of the Sharing Economy, such as the tendency to decrease transaction costs in addition to generally democratizing the marketplace, is an important milestone, which opens up opportunities for multiplication of best practices/pilots far beyond the services, property, transportation industries with things like AirBNB, Lyft, etc.

Next logical step would be to pick virtually any sector and figure out how to re-invent it in a meaningful, 21st-century way.

Take education, as an example – universities (either through private or public funding) invest hundreds of millions in content, yet tend to keep it exclusive. The core service they offer might be exclusive by choice, but living in the knowledge economy, we can safely assume that it's only a matter of time before projects, such as the OS.UNIVERSITY, start to enable individuals, corporations, nonprofits, and governments to benefit from the distribution, sharing and reuse of the excess capacity of knowledge products and services. While in the same time the concept of 'wholesale' Academia (along with its 2.0 and 3.0 versions) continue to lose relevance.¹⁰⁸

Such a setup in the spirit of the Sharing Economy does not directly translate into 'free higher education for all'. However, it does mean significantly lowering the social cost of education through reduced transaction costs and new value, originating as an outcome of more efficient use of untapped/spare productive capacity. Not to mention the common premise that the value of goods increases when the information about them is widely distributed (either through online platforms or through other means).

Image 1. Presenting the topic at the National Assembly of the Students' Unions in Bulgaria.



Source: Project Archive. (Varna, 2016)

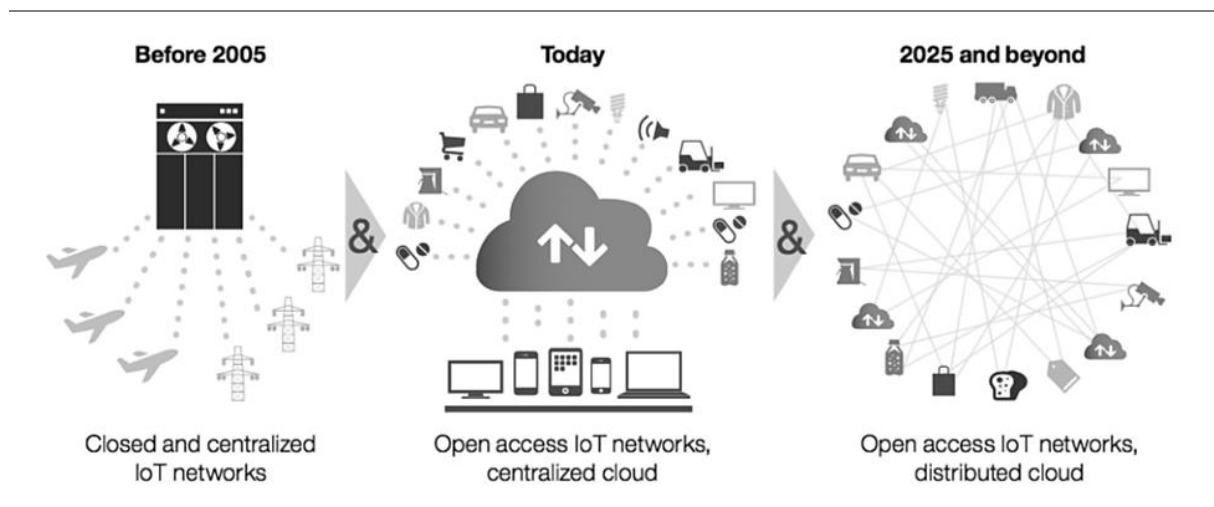
¹⁰⁸ Apart from teaching and research, serving society is becoming a coherent domain for the classic university. The transition towards fulfilling this third mission is called by some researchers the second academic revolution (Etzkowitz, 2004). The active universities in that process of transition are called entrepreneurial universities. The digitalization of Academia and its operations (e.g. the numerous forms of online learning) is considered by many to be the third academic revolution (Academia 3.0). Academia 4.0 on the other hand, a term coined by the author, is associated with the fundamental change on how educational products are going to be created and are going to be offered in the context of Industry 4.0 – in an innovative distributed vs. outdated centralized manner.

I had the opportunity to speak more on the subject during the annual gathering of the students’ unions back in 2016, where I was invited as a former Secretary General to present the opportunities which the Sharing Economy 2.0 holds for all universities. The bottom line – knowing the real drivers of the Sharing Economy, knowing it’s about the unutilized opportunities, will help us draft the right kind of transformation charter for every business, every sector, industry. Going forward, being disrupted will be a matter of choice, not a destiny.

- **It’s no longer peer-to-peer, it’s everything-to-everything.**

Arguable as it is, peer-to-peer was the common perception of the Sharing Economy 1.0., despite the fact an intermediary is almost always involved with a fee, charged on the intermediation. However, we now know that when the boundaries between different markets start to vanish, and unexpected kinds of competition occur, everyone and everything can start entering in the business of challenging incumbents, forming a technologically-driven community grid where “The Grid”, rather than the peer is what you are primary driven to connect to. The same way the chain of data is the source of power and trust in a crypto-project.

Figure 1. IBM’s ‘Device Democracy’ landscape, visualizing the ‘many-to-many’ principle.



Source: IBM Research. (2017)

Thanks to the advancement of the Internet of Things (IoT), we can tune our fridge for example into an agent to order fresh milk around the date of expiration of the milk box that we already have. Many of us know about various such IoT interactions. But how many of us know that we can connect our smartphones to Berkeley’s Open Infrastructure for Network Computing (BOINC) software and help advance cancer research or other important global humanitarian causes?

Only through one of the BOINC projects – the IBM-powered “World Community Grid”,¹⁰⁹ 3 billion research results have been processed by volunteers all over the world who are supporting basic science by donating unused computing time. This is what I called the “Internet of People” (IoP) in 2016 and if we go back to the core of the Sharing Economy principles, we will see that its application is indeed demand driven - it is about tapping into spare productive capacity.

What the blockchain revolution revealed is that connecting people’s smartphones to do collaborative research is great, but it is greater if we connect the people themselves beyond their technological devices. From open source technology to open source society and economy. Basically, Academia 4.0 is about upscaling and humanizing the concept of distributed and/or grid computing, i.e. the model for sharing computer power and data storage capacity over the Internet. A model that applied to higher & further education, enables a “Diploma of Things” future for the system of academic credentialing, enabling a fully-fledged “Network University” or “Open Source University” (as we call it) to emerge in the not so distant future as a next step beyond the set of IT innovations that will be at its core and that we discussed throughout the book in great details.

Image 2. “A future without a diploma is better than a diploma without future” slogan.



Source: Project Archive. (Sofia, 2014)

¹⁰⁹ Visit: https://www.worldcommunitygrid.org/about_us/viewNewsArticle.do?articleId=510.

What I mean is that OS.UNIVERSITY as a product is just part of the broader transformation towards “Academia 4.0”, it is not “Academia 4.0.” itself. The science crowdfunding platform “Experiment.com” and “Zooniverse.org”, a people powered research platform, among other great examples, represent the exact same spirit of transformation. The other projects’ success stories come to show that there is a vast potential for turning “IoP”-based opportunities into profitable social entrepreneurial ventures. I had the opportunity to brainstorm around this with the attendees of 2016 and 2017 Sofia Business School Master Classes, utilizing the “Business model canvas” approach and the examples mentioned above in the context of the Sharing Economy 2.0.¹¹⁰

Going back to the example around BOINC, right after my workshop in 2016, it was time for Prof. Leandar Litov to take the stage. He is the Head of the Atomic Physics Department at Sofia University & Head of the Bulgarian team of scientists at CERN. CERN being one of the largest users of grid technology, it might not have been a surprise for prof. Litov to find out that he is now in a room full of associates that are working on projects, related to the Large Hadron Collider, such as the ATLAS project¹¹¹, without ever stepping into a CERN facility. Soon, when an academician steps into a university auditorium, he or she will be seeing in the audience the people who co-author the subject’s syllabus and the course curriculum – equal contributors of common, yet customized learning experiences with open beginnings and ends, recorded over the blockchain and agreed upon through smart contracts.

- **Institutions are becoming Uber-aware, if not yet Uber-friendly**

In December of 2016, I was invited to take part in “Bulgaria 2030” initiative of the President of Republic of Bulgaria, having previously served as an intern to the Administration of the President. I had the opportunity to share my thoughts in the area of energy innovation, more especially around a potential “Uber of Energy” – a topic we’ve previously discussed at Sofia Business School along with Carlo Stagnaro from the Istituto Bruno Leoni as a keynote speaker, who presented a great paper on the effects of the Sharing Economy on innovation and economic development, as well as in regards to the regulatory challenges ahead.

¹¹⁰ The workshop presentation is available for you to have a look at www.slideshare.net/daskalov.

¹¹¹ Visit: <http://atlasathome.cern.ch/>.

Having the opportunity to interact at the forum with many open-minded young professionals, I came to the conclusion that we all share the common understanding that as industrial organizations and structures change, regulation should change as well to support growth, instead of deepening the transformation issues along the way. They need to leave behind many of their long-held truths, because of the fast-changing environment. In a period of declining and constrained resources for public education, many educational authorities lack the internal expertise and capacity to manage and analyze the data needed for effective data-informed decision-making. Let's enable the communities to do so.

According to expert predictions robots might take over 30% of the job market by 2025¹¹², while in reality this short time span is not enough for a regulator to bring forward a mutually beneficial legislation around a single innovation that have rolled-out in the past few years... Like it or not, this kind of reactive, close-minded approach is simply not doing us any good. Regulation is based upon a specific understanding of the market, but as markets are starting to emerge or disaster with a single click of a mouse, this understanding is no longer relevant.

The good news is that experts, such as Carlo, are already working with the EU institutions in the field of energy in order to prepare the legislative bodies for the next "Uber", while in the field of education me and my colleagues, working on the OS.UNIVERSITY project, have the opportunity to benefit from programs such as "Erasmus for Entrepreneurs" in order to advance our product in accordance with the overall EU-agenda around open education.

- **Instead of Conclusion**

"If you want to know how things really work, study them as they're coming apart", wrote William Gibson in his "Zero History".

We had a lot to study in the past 10 years, I am sure that we will all agree... from the collapse of the financial system in 2008 to the birth of an entirely new crypto-economy as a response to the systemic institutional failures. What we learned will definitely be of help in the next 10 years as they will also have their winners and losers - those are the risks of living in the dawn of the Fourth Industrial Revolution.

¹¹² Source: <http://www.bbc.com/news/technology-34066941>.

At least we now know more about the rules of the new game, which is the most important prerequisite for a fairer and more rewarding play, for a race towards the top of human capabilities and aspirations, not towards the bottom of disrupted industries. Due to the experience gained over the past decade, we can assess what is being rewarded, what is being penalized.

We know more not only about how things really work (as William Gibson put it), but also about how things can work otherwise. This is the beauty of the blockchain rise – it made us reimagine thousand years’ old truths. For example, the “truth” that the university should be a closed system with a pre-defined cycle for learners to go through. “Why so?” we asked ourselves, and we started contributing to an alternative future. A future where the University looks more like a DAO (Decentralized Autonomous Organization)¹¹³ and less like an Ivory Tower.

By connecting the dots and getting to understand more about the patterns around us, we can manage better the change ahead in an ever-growing state of volatility. If nothing else, I hope that this book helped you achieve this mindfulness.

THE END

¹¹³ According to “Blockchain Hub”, a distributed autonomous organization (DAO) is a decentralized network of narrow-AI autonomous agents, which perform an output-maximizing production function and which divides its labor into computationally intractable tasks (which it incentivizes humans to do) and tasks which it performs itself. It can be thought of as a corporation run without any human involvement under the control of an incorruptible set of business rules. These rules are typically implemented as publicly auditable open-source software distributed across the computers of their stakeholders.

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ONLINE RESOURCES:

- United Nations Sustainable Development Goals:
<http://www.un.org/sustainabledevelopment/education/>
- “Higher Education Technology Landscape 2017” report:
<http://www.eduventures.com/2017/02/introducing-2017-higher-education-technology-landscape/>
- Semantic Versioning:
<http://semver.org/>
- Open Blockchain Initiative:
<http://blockchain.open.ac.uk/>
- Open edX:
<https://open.edx.org/>
- Crypto-JS:
<https://www.npmjs.com/package/crypto-js>
- “Is there a bubble in the higher education?” article:
http://www.capital.bg/politika_i_ikonomika/mnenia/2016/09/09/2824477_ima_li_balo_n_vuv_vissheto_obrazovanie/
- “10 ways Blockchain could be used in education” article:
<https://oeb-insights.com/10-ways-blockchain-could-be-used-in-education/>
- “Experts See New Ways to Track Learning Experiences with Blockchain”:
<https://edtechmagazine.com/higher/article/2017/09/experts-see-new-ways-track-learning-experiences-blockchain>
- “The Blockchain for Education: An Introduction” article:
<http://hackeducation.com/2016/04/07/blockchain-education-guide>
- Node-rsa package for encrypt/decrypt:
<https://github.com/rzcoder/node-rsa>
- “Ethereum Smart Contracts” Workshop, organized by OS.UNIVERSITY:
<https://medium.com/@opensourceuni/ethereum-smart-contracts-workshop-by-the-open-source-university-team-bb7435d9603d>
- “Blockchain & Education: A Big Idea in Need of Bigger Thinking”:
<https://www.coindesk.com/blockchain-education-big-idea-need-bigger-thinking/>
- “By the numbers: MOOCs in 2016” report:
<https://www.class-central.com/report/mooc-stats-2016/>
- HPE “Living Progress Challenge 2016” website:
<https://livingprogresschallenge.hpe.com/idea-awards/>

APPENDIX.

AUTHOR'S BIOGRAPHY

Hristian Daskalov is an award-winning researcher¹¹⁴, author of the pioneering academic book “*Stakeholder Management in Higher Education, Research & Innovation*” (2014). Co-Founder of the Center for Shared Science & Business at the Faculty of Management – Technical University of Sofia.

He is affiliated to the Brain Workshop Institute, serving as a stakeholder management expert with experience as a consultant to the Bulgarian Ministry of Economy on the National Research & Innovation Instrument for Smart Specialization (S3 Strategy) and the Operational Program for Smart Growth through Education & Science (OP NOIR), a 500-million euro public investment program.

Being a project lead at the Open Source University (OS.UNIVERSITY) - a globally recognized edtech initiative to introduce the world's learning & development ledger on the Ethereum blockchain, Hristian specializes in researching the collaboration around open source blockchain technology projects at the Technical Universities of Sofia, Riga, and Brno. Currently on a European Commission funded project at London, he works around bridging the gap between fintech and edtech innovations, together with Cobden Partners, a leading UK-based investment consultancy.

Leading an international team of 20 + renowned academicians, technologists, business and NGO leaders, Hristian has previously been part of the operational management team behind a multi-billion dollar growth-oriented program at Hewlett Packard Enterprise (HPE) and has participated in the governance and execution of a wide range of transformation-related programs, ranging from the implementation of major intranet collaboration platforms (the 2nd largest community of profession in HPE) to the design of an EMEA-wide corporate engagement program (winner of 2016 “*Innovators at Heart*” global award).

¹¹⁴ Awarded 2017 “*Best Doctoral Candidate*” by the Bulgarian Minister of Education & Science.

