Master Projects connected to a Blockchain-based Equity Investment and Trading Platform

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We are below suggesting 9 master topics around building a distributed blockchain-enabled platform for stock exchange. Each thesis (30/60 units) will be associated with the University of Oslo (UiO) in cooperation with AtomIQ AS. UiO will be involved through Department of Informatics (IfI) and Faculty of Law (FoL) - Department of Private Law, including UiO Blockchain Lab (`https://www.blockchainlab.no/`), Digital Infrastructure and Security (DIS), Reliable Systems (PSY), and Norwegian Research Center for Computers and Law (NRCCL).

All master projects are supervised by UiO Department of Informatics (IfI), Faculty of Law (FoL), and AtomIQ AS.

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Background: The Stock Exchange as an Innovation Engine

We are building a global stock exchange and ecosystem for capital markets and deep tech start-ups. The purpose of this platform is to enable a liquid marketplace for buying and selling shares in deep tech start-ups. Furthermore, the platform will provide guidance to start-ups for maximising business success and minimising the investment risk for investors and traders.

To accelerate the development of deep tech at scale, a global democratic and

transparent financing system for science based innovation is urgently needed:

- By providing a global stock exchange for deep tech start-ups, retail and institutional investors alike can invest in the private equity class at scale.

- This will increase the availability of assets for investment in the private equity class worldwide, effectively financing more deep tech innovation.

- A distinguishing and truly disruptive feature is the provision of liquidity, allowing investors to engage in short term private equity trading.

AtomIQ will provide a technical and legal framework for investors to engage in efficient and streamlined trading of equity stakes in deep tech start-ups.

Master Topic 1: Smart contract for an investment and trading platform

Keywords: financial trading, smart contracts, blockchain, digital auction, digital wallet, digital currency

Thesis Description and Scope

The thesis is part of the overall task of developing a trading platform for assets, such as shares in a start-up company, using a new digital currency called IQ. The main task is to make a smart contract in Rust/Solidity for supporting the financial transactions that should be possible for users of the AtomIQ investment and trading platform.

The platform should be distributed allowing multiple registered parties to invest and trade at the same time at scale. Transactions should appear to be immediate for users, while the implementation will use an auction process to do the actual trading which should be as fast as possible.

The selection of the proper auction process should be investigated.

Possibilities of transaction failure should be investigated too. Such failure should be avoided as much as possible, but if failures occurs they should be compensated by appropriate fault handling mechanisms, possibly including roll-back.

The assets in this case will be synthetic stocks (derivates) which links to the underlying securities (shares in deep tech start-up companies) listed on

the AtomIQ electronic market place, which will be made available as tokens. The platform will use its own digital currency, called IQ, and the trading of shares will be done through the IQ currency. IQ can be exchanged for other kinds of token like e.g., BTC, ETH, stablecoins, and also for real currencies.

A user may have an electronic wallet, either an AtomIQ wallet with IQs or another kind of digital wallet which can convert into a real currency (like USD or Euro).

Master Topic 2: Integrated tokenisation engine

Keywords: financial trading, smart contracts, blockchain, tokenisation, digital wallet, digital currency

Thesis Description and Scope

Tokenisation, as it pertains to private equity, is the process of creating virtual tokens that would represent ownership in, say, a start-up company's assets. This is similar to the recent digital asset craze, non-fungible tokens ("NFTs"), except start-up company tokens would be tied to the value of a physical asset.

The thesis is part of the overall task of developing a tokenisation engine that will automate the issuance of new tokens which are assets created in the form of ERC20 and ERC721. These assets are in fact proxies of real stocks in deep tech start-up companies. The platform will keep track of who owns these stocks at any given time.

As physical assets would back the tokens, the value of the tokens would fluctuate based on the performance of the asset, similar to traditional private equity investing but with the ease of transfer conferred by the utilisation of blockchain technology.

Before a start-up company can be listed on the AtomIQ exchange, an adequate share price must be set before the start-up company can be listed. A fair share price is semi-automatically determined by set of factors which can be subdivided into three categories:

1. AtomIQ Intelligence Component (back-end)

2. Real-time market data

3. Share price as it originally was set by the issuer of the real stocks, i.e. by the management of the start-up company

Eventually, the start-up company can be listed on the AtomIQ integrated electronic stock exchange, and the issued tokens (proxies of real stocks) are made available for investment and trading. Consequently, the share price of the tokens will be in flux (Law of Supply and Demand), reflecting the market cap of the start-up company.

An integrated 'Cap Table as a Service' is provided for real stocks issued by all start-ups to be registered on the platform. When stocks are bought/sold, all transaction data (ticker code, number of assets, price per share, name of buyer, name of seller, time stamp) is written to the distributed ledger stored on the blockchain.

According to law, companies are obliged to keep an overview of who owns shares in the company at any given time. The information in respective national shareholder registers is public information and everyone has the right to see it. By providing an integrated 'Cap Table as a Service' we put in place a mechanism which ensures that all tokenised stocks listed on the AtomIQ stock exchange can only be traded through the AtomIQ platform.

Master Topic 3: Modeling and analysis of trust, safety, security and privacy

Keywords: financial trading, smart contracts, blockchain, digital auction, digital wallet, digital currency

Thesis Description and Scope

This thesis should make a high-level description of the proposed investment and trading platform as described in thesis topic 1, and analyse security and trust issues, as detailed below. Finally it should suggest changes to the investment and trading platform based on the results of the analysis.

- High-level description of the investment and trading platform

- Prototyping

- Simulation

- Analysis of violations and attacks

- Analysis of security issues, and vulnerabilities

- Encryption

- Analysis of privacy

- Handling of retention and user changes in privacy consent?

- Restriction on third party usage

- Analysis of trust

Knowledge of formal modeling techniques (such as rewriting logic) is advantageous.

Master Topic 4: Constructing an IQ Wallet and an associated app

Keywords: financial trading, smart contracts, blockchain, digital wallet, digital currency

Thesis Description and Scope

The goal is to construct an IQ wallet to allow ERC20 and ERC721 operations. The Wallet will contain IQ digital currency and integrate with browsers and AtomIQ App.

The Wallet must implement authentication and identity confirmation. The requirements must observe security aspects and regulatory compliance.

Master Topic 5: Interface between blockchain and AtomIQ (Oracle)

Keywords: financial trading, smart contracts, blockchain, digital wallet, digital currency

Thesis Description and Scope

In order to develop smart contracts to allow tamper-proof communication between blockchain and the AtomIQ Intelligence Component (back-end), the interface towards the blockchain is crucial, and dependencies w.r.t. different blockchain providers should be clarified. This thesis must involve developing and testing smart contracts for Chainlink or similar products, using the Solidity/Rust programming language.

The financial information update must be as fast as possible. The communication service speed is an essential requirement to create efficient financial services.

Master Topic 6: Design and usability aspects of a mobile app with a digital wallet (1 to 2 students)

Keywords: financial trading, smart contracts, blockchain, digital wallet, digital currency, usability, user friendliness, HCI

Thesis Description and Scope

The purpose of this thesis is to design a user friendly interface of a mobile app for the electronic investment and trading platform. It is essential that the design of the app is intuitive, very simple and easy to use and that the relevant information is easily available.

An example of a similar and successful app: *Robinhood* (`https://robinhood.com/us/en/`) which is known for pioneering commission-free trades of stocks, exchange-traded funds and cryptocurrencies via a mobile app.

Another example is of a visualisation tool: *Finviz* (`https://finviz.com/map.ashx?t=sec`) which makes market information easily accessible to traders and investors.

The proposed interface needs to support all these services in an intuitive and user friendly manner. This requires experimentation with users through interviews and surveys, while developing prototypes.

Simulation and game theory can be used to give realistic testing of the platform and its services.

Master Topic 7: Design and usability aspects of a web interface for the AtomIQ platform (1 to 2 students)

Keywords: financial trading, smart contracts, blockchain, digital wallet, digital currency, usability, HCI, visualisation

Thesis Description and Scope

This topic is about investigating a suitable interface for the AtomIQ platform. The platform will have functionality covering a wide range of services, including

- Investment

- Trading

- Clearing

- Settlement

- Market signals (trends, alerts)

- Market analysis (query, search)

- Stock screening

- Portfolio management

- Portfolio analysis (risk management, portfolio diversification, optimisation)

The service should be integrated in a kind of *dashboard* with visualisation of the different services and relevant real-time information.

The proposed interface needs to support all these services in an intuitive and user-friendly manner. This requires experimentation with users through interviews and surveys, while developing prototypes.

Simulation and game theory can be used to give realistic testing of the platform and its services.

Master Topic 8: Tokenomics

Keywords: financial trading, smart contracts, blockchain, digital currency, transaction business models, contract law, international private law, tax issues

Thesis Description and Scope

Analysing the business models and the economics of trading tokenised securities listed on the AtomIQ platform

This thesis is part of the overall task of conducting in-depth examination of all the significant aspects of a cryptocurrency. This will include analysing business models and processes involved with tokenising company shares, including

- The pertinent legal and tax issues,

- Various transaction fees and listing fees,

- Interest rates,

- Economic incentives connected to value exchange in decentralised finance applications,

- How they are calculated all together, including how exchange-traded cryptocurrencies enable economies of scale.

The practical part of this thesis is to come up with a new model for token governance, a consensus mechanism, and policies associated with the creation and distribution of a new digital currency (called IQ) together with suggested steps for implementing IQ on the AtomIQ platform. The latter will include designing new rules for transferring value alongside associated computer code, which will allow users of AtomIQ to leverage tokens for trading in terms of products and services offered on the AtomIQ marketplace. In addition, tokens shall also ensure profit distribution in the form of dividends as well as other financial advantages to users of the AtomIQ platform.

The legal issues cover how to organise new business forms from more traditional ones, such as companies or cooperatives, and then trading 'securities' on these business forms, i.e., to what extent does company and securities market law grasp businesses and their issuances as *Initial Coin Offerings* (if any). Important quesions about the role of contract law and international private law conserns are: whether the contract is only a smart contract – or is there room for 'regular' contracting governed by national contract laws, such as the Nordic Contracts Acts that were harmonized hundred years ago. So there are two levels of analysis that can be made, namely tokenization of a 'regular company' as Norwegian private company (aksjeselskap) and tokenization of a smart contract ledger 'company' as *Decentralized Autonomous Organizations*. In the former the question is whether the company law can

grasp issuance of non-traditional securities, in the latter, what laws can grasp the tokenization (if any).

Master Topic 9: Regulatory compliance and implications for design (2 students)

Keywords: financial trading, smart contracts, blockchain, digital auction, digital wallet, digital currency, legal frameworks, regulatory compliance, multi-jurisdictions, Finanstilsynet (The Financial Supervisory Authority of Norway), European Blockchain Services Infrastructure (EBSI), European Law, Policy, Regulation

Thesis Description and Scope

Analysing the legal and regulatory frameworks relevant to the AtomIQ platform to ensure compliance with laws on financial trading and infrastructure

This thesis involves analysis of legal and regulatory frameworks relevant to this project, to make it an integral part of the other master's projects connected to this project. The purpose is to ensure that all the other master's theses do not completely miss the goal of what is possible to carry out regulatory, applying to platform architecture, money representation and tokenomics, and to ensure compliance with laws on financial trading and infrastructure intended to protect investors and safeguard financial stability.

A master student at the Blockchain Lab in collaboration with a law student (and the respective supervisors) will look at the regulatory aspects and what guidelines it should have on the design of the AtomIQ platform.

The topic is a complex field as the focus is on the highly regulated area of traditional markets. This topic is also theoretically challenging as we are struggling between ownership and control of a distributed platform. Therefore two master students are desirable.

It should be mentioned that we have perhaps chosen the most thoroughly regulated area that is conceivable on both the securities side and the money side. Today, few traditional assets are traded on blockchain platforms, and where this is done, it is thoroughly regulated, see for example `https://www.sdx.com/`

Monitoring activity of the European Blockchain Services Infrastructure (EBSI),

a pan-European regulatory sandbox for distributed ledger technologies, or DLT, and blockchain in particular, will be an important part of this master project.

Stock and bond issuance, trading and settlement via blockchain technology will be tested in the European Union under a five-year pilot program approved March 2022 by the European Parliament in Brussels. The measure was first proposed by the European Commission. It will give EU members the chance to test out new crypto applications that would otherwise be blocked by existing laws governing financial market infrastructure.