

# Initial Plan

Dematerialisation of Share Certificates using Blockchain  
CM3203  
One Semester Individual Project  
40 Credits

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# Project Description

In the UK, when a person buys shares in a company they are issued a share certificate. This physical certificate shows many things, including the name of the company they bought the shares from, how many shares they purchased, the amount they paid, and the class of shares (Chen, 2018). There are several problems with having physical copies, they are more costly, can be lost, stolen, damaged or even forged.

My application hopes to solve this by "dematerialising" these physical certificates, taking the worth out of the physical certificate, putting the value into a blockchain. The shares will be stored on the blockchain and associated with the user, going into their "wallet". Users on the network can then trade these shares on the peer to peer network.

Dematerialisation of share certificates has been done by others, for example CREST (Kenton, 2018) and Capshare (Capshare, 2019), however my approach will be different as it will be using blockchain technology. A blockchain is a chain of data blocks containing transactions, each block links to a previous block, which it stores a cryptographic hash of. This means that integrity of the chain can be verified back to the first block, as any change to data within a block will result in the change of the cryptographic hash of the block. Nodes in the network will then agree on whether the block being proposed is accepted onto the chain, this decentralises the network as a distributed consensus is required from more than one central node (Nofer et al, 2017, p. 184).

The decentralisation of the network means that there is no central authority that the users have to trust, removing any middle men in the process so also reducing fees (Lisk, 2019). It also means being able to store and trade their shares securely due to the security of the blockchain by way of decentralisation, cryptography and distributed consensus (Karame and Capkun, 2018, pp. 11-12).

The main functionality of this application will be the electronic representation of, and trading of shares. Shares will go from one user/owner and be traded to another user/owner. I will need to make sure that there is some functionality to deal with the "double spend" problem that could be possible here, by the user using the same shares in their wallet more than once (Swan, 2015, p. 2).

## Ethics

After having a meeting with my supervisor, we have decided that this project will not require ethical approval. We will generate our own data in order to test the program.

# Project Aims and Objectives

There are 3 main aims in this project: Installing the blockchain network, writing an application to interact with the blockchain, and creating a web interface to make the application more usable.

## Install Blockchain network

This aim will likely take the longest with the greatest amount of risk, as I have had little experience with blockchain applications in the past and have never installed a blockchain network. I will also have to learn a new coding language, which could take more time than planned. This risk has been reduced by not planning in any work over the easter period, giving me time to catch up if I do fall behind on this.

### **The objectives of this aim:**

- Research different frameworks for making a blockchain network
- Choose a framework that will work best with my use case
- Research coding language for chosen framework
- Set up the network and install the blockchain

## Writing Blockchain Application

This aim will again be challenging having not written a blockchain application before, however I believe this can be completed in the time planned with the basic functionality. Easter can then be used to add extra functionality if I am ahead of or in time with the schedule.

There is also time in this section devoted to evaluation/testing of the blockchain application against some functionality requirements, as well as performance/scalability requirements.

### **The objectives of this aim:**

- Have some interaction with the blockchain through use of API
- Write application/smart contract
- Test the blockchain on performance and scalability (how many users can the network take before breaking or having a major affect on performance)

## Building Web Interface

As the blockchain application will first be a command line interface, developing a web interface will make it easier to demonstrate the application.

Any extra time I have at the end of the development period will not be devoted to improving the user interface any further, but rather to extending functionality in the application or more evaluation of the application.

### **The objectives of this aim:**

- Interface with blockchain application using API
- Build basic web interface that uses API to interact with blockchain application

# Work Plan

I have scheduled work on a week by week basis. There are 12 weeks in which to complete both the report and the application being designed, which are detailed below. Note that between week 11 and week 12 there is the Easter break. I have not currently planned any work in this period, though this could be used if I fall behind my schedule, or if there are extra "nice to have's" that I would like to implement into the application. Weeks 1 & 2 are focusing on researching blockchain, frameworks which I could use, and design. Weeks 3 - 10 are then focused on the implementation of the network, installing the blockchain on the network, and building the application to interface with the blockchain. Weeks 10 - 12 are then designated for the final report writing.

Meetings with my supervisor will be held every week to track progress and help with any issues that I may come across. I have also scheduled two review meetings, one in week 4 and one in week 8. In the meeting in week 4 myself and my supervisor will review the progress on setting up the network and blockchain, and whether milestone 1 has been hit. If it is taking longer than expected, then the plan may need to be changed to allow more time for this. In week 8 we will review the blockchain application and whether milestone 2 has been hit. Again, the plan may need to be changed at this point if I have fallen behind, which may involve planning work into Easter to catch up.

## **Week 1:**

- Research frameworks that will best fit with my use case
- Research similar implementations of my use case
- Read literature relevant to blockchain technologies/applications

**Deliverable:** Initial Plan

## **Week 2:**

- Continue research into the chosen framework
- Install network for the chosen framework

## **Week 3:**

- Design the model of the blockchain, such as the entities, structure of data, and methods
- Research how to install a blockchain on a network

## **Week 4: Milestone 1 - Blockchain installed onto the network**

- **Review meeting 1**
- Install the blockchain on the network
- Research and learn code for the chosen framework
- Build very basic application to better learn code

## **Week 5:**

- Design and implement the basic functionality/transactions
- Design for the application/smart contract
- Begin development of the application/smart contract

## **Week 6:**

- Implement more advanced functionality on the application

**Week 7: Milestone 2: Application which uses the blockchain**

- Finish development for functionality of the application

**Week 8:****- Review meeting 2**

- Build basic web frontend that utilises API
- Design and run tests for functionality of the application

**Week 9:**

- Designing and running tests for the scalability of the network (by continually increasing users on the network until it breaks) as well as performance testing
- Continue work on the web frontend

**Week 10: Milestone 3 - Simple web frontend implemented that uses application**

- Any finishing touches on the application/frontend
- Begin drafting the report

**Week 11:**

- Finish drafting the report and review

**Easter:**

- No work planned in for this, though this could be used to add extra functionality to the application, or as a failsafe if I fall behind on my plan

**Week 12:**

- Final changes to the report

**Deliverable:** Final report

## References

Capshare (2019) *Capshare*. Available at: <https://www.capshare.com/> (Accessed: 4 February 2019).

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