

**Students doing individual coursework must complete this cover sheet to accompany assessed coursework submitted.**

**All coursework will be submitted and assessed on Learn.**

Student Number:			
Degree Programme:	Computer Science MSc programmes (ACS+AI+DS)	Part:	P
Module Title:	Research Methods	Module Code:	COP500
Session:	2021-2022	Semester:	2
Title/Description:	Research Methods	Part:	P
This coursework represents	100	% of the module assessment	
Module leader:	Dr. Lin Guan		
Date set:	20 Jan. 2022		
Date to be handed in:	1) Full-time (FT) students: Report on Week 9 Fri. 6 <sup>th</sup> May 2022, before 12noon on Learn. 2) Part-time (PT) students: Report on Week 12 Fri. 27 <sup>th</sup> May 2022, before 12noon on Learn.		

Specification:	See attached below
Method(s) of Presentation:	- Online submission as PDF format for individual report - All pages must be numbered. - A front cover page should include your name, student ID number, and course. - Attach main reference papers as an appendix
Assessment Guidelines:	See attached below

**DECLARATION:**

We certify that the attached coursework is our own work, except that anything which is used from or based upon the work of others has its source clearly and explicitly cited in the references.

*All group members must sign below.*

Student Name:	ID Number	Signature:	Date:

No. of pages:

## **Coursework 21COP500 'Research Methods'**

The weight of 20COP500 module is 15 credits and the module will be assessed by 100% individual coursework (60% deliverable 1 and 40% deliverable 2).

### **Deliverable 1 Objectives (60%)**

You are to explore, understand, and contextualise your chosen research area and present your understanding in a report containing a research diagram that explains your interpretation of the field(s). If you are considering a project that draws on two or more different fields, you should show how these fields link together and what previous work has been done on the overlap between them.

There are three parts to this work:

1. Undertake a literature review in your chosen research area to understand and contextualise the inter-relationships between topics, the gaps, the overlaps, and current work and thinking in the area. Identify key, seminal texts and papers in the field.
2. Put together a research diagram (choose between a research territory map/spider diagram/or hierarchy diagram) for your chosen research area.
3. Write a report of 1000 - 2000 words explaining how the field is structured, how the topics relate to one another and any seminal papers/authors in the field. This report should also explain the reasoning behind your research diagram and explain why it is structured in this way. Make sure your report is split into appropriate, numbered sections. Sections you should include as a minimum – 1. Introduction (overview of the chosen area and why you have chosen it); 2. Research Diagram; 3. Explanation of your Research Diagram (including gaps, seminal works, authors, relationships between topics, sub-topics, etc.); 4. Conclusions; 5. References (in Harvard form).

### **Marking guidance**

Marks are based on the depth of research study undertaken and academic content within the written report. For example, a superficial diagram and report with little academic content and little evidence of research around the subject area will clearly attract low marks. For high marks the report should contain a detailed research diagram with a mature critique of the field including pertinent references.

- Meeting deliverable objectives and requirements above (e.g., appropriateness of research diagram; evidence of understanding of field; discussion and contextualisation of topic area etc.) 70%
- Structure (e.g., does the deliverable present a logical clear structure and an appropriate distribution of contents?) 15%
- References, language and presentation style (e.g., Is the presentation understandable, with clear explanations at the right level, including right referencing?) 15%

### **Deliverable 2 Objectives (40%)**

Undertake a critical evaluation of two academic papers in your field of interest.  
Compare and contrast the two papers.  
Explain how the papers fit into the wider field and what they contribute to that field.  
Evaluate the process you have followed to choose and critically evaluate the papers.

The report should be structured as follows:

1. Introduction (10%)  
Introduce the field the papers are from. Introduce the two papers in turn and explain why you have chosen them in particular. You can refer to your report from deliverable 1 if you want to discuss the context.

As part of the introduction - were there other papers you considered but decided not to use – and why?

2. Critique of Paper A (25%)

3. Critique of Paper B (25%)

3. Compare and contrast the two papers (20%)

4. Conclusions (20%)

e.g., What have you learnt from the papers?

How did this process of evaluation work for you? Was it useful?

What will you do differently, if anything, next time you read an academic paper?

Has your understanding of the field changed in any way since reading these papers?

### **Marking guidance**

Marks are based on the depth of academic content within the written report. A superficial discussion of the papers, little contextualisation, little justification and little critical evaluation of the process will attract low marks. A good report will provide a good academic discussion of the field and justification for the chosen papers. The critique of the papers will be in-depth and professional. The report will provide a mature evaluation and comparison of the two research papers and the conclusions will be insightful. Around at least 10 pages would be needed (12-point font) for a good report. The percentages indicate the relative weightings of contents section when marking.

- Contents: Meeting deliverable objectives and requirements (e.g., appropriate choice of papers; evidence of understanding of field; critical evaluation of those papers; and appraisal of the process etc.) 70%

- Structure (e.g., does the deliverable present a logical clear structure and an appropriate distribution of contents?) 15%

- References, language and presentation style (e.g., Is the presentation understandable, with clear explanations at the right level, including right referencing?) 15%

The individual written coursework (reports including both deliverable 1&2) must be submitted on Learn: 1) Full-time (FT) students: Report on Week 9 Fri. 6<sup>th</sup> May 2022, before 12noon.  
2) Part-time (PT) students: Report on Week 12 Fri. 27<sup>th</sup> May 2022, before 12noon.

***Dr. Lin Guan, Jan. 2022***

# Coursework 21COP500- Research Methods

## Deliverable 1 Objectives (60%) - Literature Review

### Introduction

Non-Fungible Tokens (NFTs) are units of data stored on a blockchain, primarily Ethereum blockchain, which is non-interchangeable. These can be traded and sold on a public digital ledger.

Transactions have always been authorised by a central intermediate between two parties, however in recent times a new system has been developed that can operate in a decentralised fashion. These are called smart contracts which are lines of code which automatically sanction the transactions between parties when the predefined conditions are met. Understanding the concept of how smart contracts operate are the foundation of understanding of how NFTs are exchanged. [1]

The following topics are required to fully research the basis of NFT trading and cryptocurrencies. The **history of centralised transactions**, fundamentals of **blockchains** and how it uses a **digital public ledger** to create and execute **smart contracts**.

### Research Diagram

Figure 1 shows research territory map of NFTs – this shows how each topic that have been researched and how everything is linked. The circle represents each topic being covered starting with the initial NFT. From research NFT is much like a smart contract so, it would be encompassed withing the topic of smart contracts. This is the basis of what is being demonstrated by the Territory Map

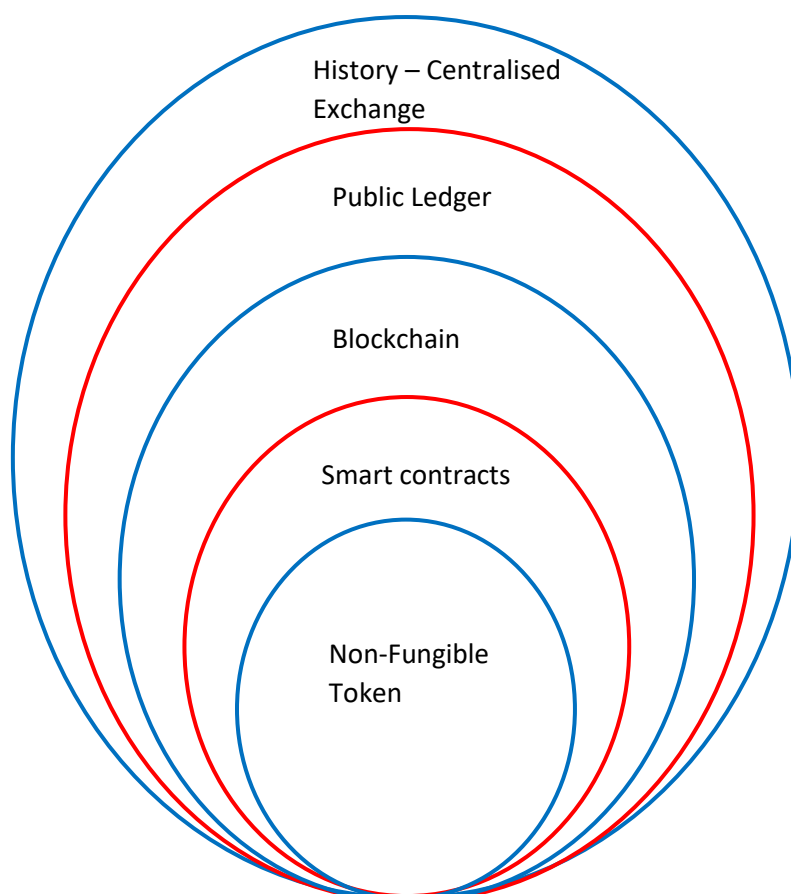


Figure 1- NFT- Territory Map

## Explanation of Research Diagram

### History – Centralised Exchange

Centralised Cryptocurrency exchange are common in the purchase of coins from online platforms which is monitored by a third party. The “third-party” concepts are the fundamental idea of centralised exchanges. Therefore, trust of the third-party is essential for a centralised exchange to occur or even to hold the currency, which is common principle used in banks. The purchase history is stored on a ledger which is held by bank or the online platform, and the parties commonly between two parties. This has an inflated cost as the platform for the exchange often charges money for the exchange to occur, which is very profitable for the third-party. [2]

Likewise for a centralised system for currency exchange it needs to follow series of laws and regulations set by the government, for example anonymity is a law in centralised exchanges, where clients contact information's are stored and gathered on the ledger. (A ledger is a history of all transactions a company or party has completed; in crypto exchange this is often a digital ledger)

### Public ledger

In old-fashioned era public ledgers were used in villages as a way to keep records of transactions between all parties present in the village, such as blacksmiths, farmers, and traders. This was a method of verification by public by exposing every purchase, trade, agricultural commodity, news to community view.[2]

With the emergence of cryptocurrency exchange in recent times, a blockchain system was introduced which uses a similar mechanism for maintaining and verifying transactions. Due to its success the use of public ledger for crypto exchanges has grown in popularity in the world of cryptocurrency. The identity of the participants, their credit and recordings of all transactions are retained anonymously between the platform and client. [2]

### Blockchain

Bitcoin introduced a blockchain system, a digital public ledger used for cryptocurrency. The blockchain is a copied data structure dispersed and shared among the clients of a network.

The blockchain holds the data, which is timestamped between each update of the blockchain. Individual blocks can be identified by its ‘cryptographic hash,’ the hash has a reference indented into it from the previous update of the block. The chain of blocks is thus created by the establishment of links between each block. The history of transaction carried by each block is passed onto the blocks that follows, apart from the initial block. The blocks are also immutable, this ensures trust for the distribution between clients without the need for a third-party intermediate, as it is impossible for anyone to tamper with the data structure of the blockchains. [3]

### Smart contracts

Smart contracts are considered a breakthrough in blockchain technology. The first smart contract was established in 1990s, where all terms and conditions of an agreement is executed by a computerised transaction procedure. [5] The lines of codes ensure that after the conditions are met

the contract is fully and automatically implemented, any breach of contract will be documented digitally without delay, and the member who violated the contract will be penalized immediately. [3]

The fundamentals of blockchain systems permits the smart contracts to be used. Smart contracts are embedded on to blockchains, much like the cryptographic hash. The codes in the smart contract are then executed on computer systems. Every settlement of the contract is recorded as an immutable transaction which is executed and stored in the blockchain. [4][5]

### Gaps

The knowledge about NFTs is still at its youth, as it is a recent development. There are many challenges due to this lack of data and experience involving NFTs. A major problem is the uncertainty in determining the market price of NFTs. NFTs price relies on the distinctiveness, ingenuity, unavailability of the customers and owners and more conditions. As these can be subjective and influenced by the real world, and reactions of the real world, the pricing of NFTs and all crypto is very volatile, so there can never be any assurance of the value.[6]

Cyber threats are a big issue that NFT clients face due to its popularity. Imitations of NFTs are being created in counterfeit stores, and this can trick people into purchasing of false products.

### Link

As previously stated, smart contracts are fundamental for the use of NFTs, The codes that generate the smart contract, existing on a blockchain, are displayed to the public network and accessible to every member due to its decentralised ledger. This feature of the smart contract enables the ownership and identity of NFTs to remain certain and immutable, yet anonymous through end-to-end encryption.

### Conclusion

NFTs are much more complicated than initially acknowledged. However above shows the steps taken to research into the NFTs in depth, and how to obtain further information.

It was determined to approach this topic of NFTs as it can be beneficial for the Part T project in Data Science. The approach started from the fundamentals of the NFTs, which was to understand the history of why crypto exchange was created with a decentralised system. The problems with a centralised system were, it needs a trustworthy third party to authorise any transactions which would have heavy charges at all ends. The decentralised system stores the exchange history and metadata are verified publicly so it is simple to verify the ownership of the assets. [1]

NFTs are a form of smart contract, which utilises the basis of a public ledger in a decentralised system, with the data of the assets and history into the blockchain (digital public ledger). This creates an immutable data transfer system, prevents form fraud and theft of ownership.[7]

Through this research it has been highlighted that there are a few gaps in the topic of NFTs, this is due to its recent bloom of attraction. The data and history of crypto is still young so definitive conclusions and research topics have not all been covered. People are also still afraid of the safety and trust with using this new decentralised system and smart contracts, as it is a huge leap forward in the advancement of technology and change in tradition trading methods. [6]

## Reference

1. Park, D., 2021. NFT Art: Decentralization of the Art World and Aura of Traces. *Korean Journal of Communication & Information*, 109, pp.127-152.
2. Investopedia. 2022. *What Are Centralized Cryptocurrency Exchanges?* [online] Available at: <<https://www.investopedia.com/tech/what-are-centralized-cryptocurrency-exchanges/>> [Accessed 7 April 2022].
3. Investopedia. 2022. *What is a Cryptocurrency Public Ledger?* [online] Available at: <<https://www.investopedia.com/tech/what-cryptocurrency-public-ledger/>> [Accessed 7 April 2022].
4. Christidis, K. and Devetsikiotis, M., 2016. Blockchains and Smart Contracts for the Internet of Things. *IEEE Access*, 4, pp.2292-2303.
5. Zheng, Z., Xie, S., Dai, H., Chen, W., Chen, X., Weng, J. and Imran, M., 2020. An overview on smart contracts: Challenges, advances and platforms. *Future Generation Computer Systems*, 105, pp.475-491.
6. Mazur, M., 2021. Non-Fungible Tokens (NFT). The Analysis of Risk and Return. *SSRN Electronic Journal*,
7. Leible, S., Schlager, S., Schubotz, M. and Gipp, B., 2019. A Review on Blockchain Technology and Blockchain Projects Fostering Open Science. *Frontiers in Blockchain*, 2.

## Deliverable 2 Objectives (40%) – Critical Review

### Introduction

This report is for the purpose to deliver a comparative study and a critical investigation of two selected journal papers. The journals are similar in topic yet individual in literature. The subject for the articles orients around crypto world and Non-Fungible-Tokens (NFTs). Paper A- is a report written by four authors, underlining the ecosystems and difficulties facing the NFT society. Paper B- is a research paper that gives further insight into blockchain system and NFT value and rarity. Each piece is read separately then criticised independently, highlighting the purpose of the articles and how data and information is represented. Both are then compared and critically analysed against one another, highlighting the differences, similarities, and the clarity of the information. The concluding statement acknowledges the weak points of both articles, but also emphasizes the assets and definitive connections of the articles. It also gives an overall preference of the most appropriate report for further development.

### Paper A

This Article A - *Non-Fungible Token (NFT): Overview, Evaluation, Opportunities and Challenges*- was written by four authors (Qin Wang, Rujia Li, Qi Wang, Shiping Chen) who have done this research collaboratively while attending different universities. This report evaluates an overview of NFTs in great detail, the vast opportunities available for the NFTS and crypto world and the risks that clients and owners face while trading with NFTs.

The layout of this report follows the guidelines of a technical report, with clear headings and subjects of interests. The abstract and introduction are key and encompasses the filling of the entire report briefly and precisely. The reports give a detailed history of the fundamentals of NFTs, and the key topics to get a decent understanding of this report. The keywords have been highlighted early on within this reported, which have been well defined and used effectively.

Each section has a brief description of what is being highlighted before approaching to give a detailed description of the topic. The conclusions drawn in this report are based of data and the gathering of data and the experiments conducted. This is demonstrated by the diagrams and results tables offered after each methodology. Appropriate technical language is used, with a formal tone and structure. It is also evident that this has been peer reviewed as the flow of the report is very natural

### Paper B

Article B – *Non-Fungible Tokens: Blockchains, Scarcity, and Value*- was written by a single author (Usman W. Chohan, MBA, PhD). This article highlights a brief history of NFTs, and the mechanisms for the creation of NFTs and the rarity of NFTs and the reasons for volatile pricing of these assets.

The structure of this article is fairly weak, as it has been written without the use of headings or clear focus on the topics of the paper. The paper had to be thoroughly read to determine which topics were highlighted, there may be more highlighted which could not be observed clearly. Only clear statement given was an abstract, the lack of introduction and conclusion shows the inexperience of this author. The author uses relevant language and uses a mix of qualitative and quantitative data appropriately, however writing style seem quite informal at certain stages. Sometimes the uses of overcomplex language can make the reading hard to follow and fully understand, likewise reading this article one must have prior knowledge to the crypto world and familiar with NFTs as definitions of terms used in this article that are the fundamentals of understanding the purpose of this paper, therefore it may be hard to comprehend if no previous familiarity has been attained.



The conclusional statements from this article are based of opinion and not backed by evidence. It gives predictions of the future of decentralised systems and public ledgers, as well as the distribution of NFTS without data or any testing of the available data.

### Findings Paper A

Initially design models of current NFTs are described, by identifying the core technical components that are utilised to create NFTs. This then portrays the requirements and protocols of NFTs. This report initially details the keywords that are relevant in this research. Simple steps of the protocol are creating of template, randomising the NFT (customisations), NFT minting and trading, and confirmation of NFT through smart contracts. This also highlights the desired properties of an effective NFT, which are verifiability with transparent executions, availability, useability without manipulation and its ability to be traded openly in the decentralised system.

The research follows this with an evaluation of the security of the current NFT system. This is done using a STRIDE risk and threat evaluation. It is highlighted with the defections of the several types of threats faced in the crypto domain and NFT world, and a results table is given which highlights the level of threat and the solutions for each.

Afterwards the article explores the current and future opportunities of the NFTs. It emphasized of the many opportunities where NFTs with the recent development and bloom of the use of NFTs in the area of gaming and boosting of the gaming industry, flourishing of virtual events and inspiring and creating of the metaverse.

Finally, the report also underlines the challenges faced by the NFTs and crypto domain. This is given in detail and examples are the challenge in suing NFTs, with slow confirmations of high gas prices for the purchases. Likewise, it highlights security and privacy issues, anonymity on the Ethereum platform.

### Findings Paper B

It is difficult to underline the exact topics covered in this report as the structure of article is poor without headings and clear divisions.

Primarily, the article gives a brief definition of the key terms used, but not all is covered. The report gives examples and comparisons of fungible assets and non-fungible assets, the differences are portrayed clearly which is beneficial to the reader, however it is very informal.

A brief history of the upcoming of smart contracts and the decentralised system is given, where files are recorded on a digital ledger open to the public. The article gives evidence of the fluctuation of the prices of NFTs are due to people, popularity and scarcity, an example given is a video of Lebron James ducking which was created into an NFT which started of fairly cheap but was sold for \$200000, due to the athletes' popularity and there only being a single owner of this video digitally in the crypto field.

The report follows this with the platforms for trading such as Opeasea.io which is an NFT trading platform that uses a digital wallet, to hold and carry out purchases of the NFTs. Opensea is a Ethereum based trading platform which only uses Ethereum currency for trading, however it is listed of other platforms with uses other crypto currencies for trading that use less gas prices during transactions, such as Solana.

Finally, the report highlights the risks which consider hacking of digital assets, fraud from third-party illegal websites, and that the future of NFT and the decentralised system may be uncertain as it is heavily influenced by the thinking and activities of wide-ranging people.

## Conclusions

Validity and interpretations are key aspects which should be the outcome of a professionally written report. It is essential that the message of the research topic has been recognised by the reader and the conclusions drawn are based on evidence provided.

Paper A does this brilliantly, as it has been written with a very fluent structure with clear headings and topic changes. The report shows that it has been written by experienced candidates, who understand the cruciality of the layout of the report. This however is lacking in Paper B, with no headings apart from the abstract; no clear separation of topics and written informally, with several spelling mistakes.

The message of NFTs highlighted by the titles of the individual papers are definitely shown in the reports, however Paper A uses technical methods when authoring the report, showing tables and research data. Paper B is very qualitative without any evidence of experiments or methodology and focuses on history with evidence of data or tables. Paper A follows a sequential route when delivering the information, as it describes the key terms, and describes the steps taken to get the conclusions precisely. However, Paper B is very direct and requires prior knowledge of NFTs and crypto domain to gather the basic underlying message of the report.

In conclusion, the above statements clearly show a preference to Paper A, this was predictable as it was written by four individuals working together, which means it was thoroughly peer checked that adds credibility to the information portrayed. However, Paper B although written by a PhD student, it clearly has not been peer reviewed as there are several errors and the conclusions are not valid as they do not derive from concrete evidence or data experimentation.

This was a biased report, as the articles were chosen at random, next it would be better to skim the reports chosen so that it can be evenly analysed for example criticising report of multiple authors together rather than a single PhD with multiple authors. The analysis of the papers has been useful for a deeper understating of the crypto domain, specialising in NFTs, and has demonstrated that NFTs are advancing at an exponential rate.

## Reference

### Paper A

Wang, Q., Li, R., Wang, Q. and Chen, S., 2022. Non-Fungible Token (NFT): Overview, Evaluation, Opportunities and Challenges.

### Paper B

Chohan, U., 2022. Non-Fungible Tokens: Blockchains, Scarcity, and Value.