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Blockchain technology and freight forwarder Exploration of implications focused on practitioners in Shanghai

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BLOCKCHAIN TECHNOLOGY AND FREIGHT FORWARDERS

Exploration of implications focused on practitioners in Shanghai

区块链技术发展对上海国际货运代理行业影响的调查

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MASTER OF SCIENCE

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DECLARATION

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my personal views, and are not necessarily endorsed by the university.

Johannes van Bohemen
Shanghai, 9 May 2020

Supervised by Professor Doctor Yin Ming
Shanghai International Shipping Institute & Shanghai Maritime University

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Just months ago blockchain technology was a vague concept for me. Heard of, but unaware what or how. While I am only starting to see the beginning, it is typical how non-technical brains can get accustomed to terms and basic logic in such a short time.

Thanks to supervisor Yin Ming for giving me the chance to select my own topic and thanks for your contributions throughout.

Then, I am most grateful to the experts who invested some of their valuable time by participating in this study. Without these colorful insights, blockchain would still be a vagary; for me at least. Also a big thanks to forwarders in Shanghai for doing a favor by completing the questionnaire, your perspectives were crucial!

Thanks to Zhang Jie (SMU faculty support) for initial translation of the questionnaire from English to Chinese. Thanks to Sun Zhenyi (classmate) for guiding me through the Wen Juan Xing survey tool. Also a big '*xie xie'*, to Wang Fangquan for helping me understand throughout the program in general. I am thankful to you all; however none bears any responsibility for the content and views presented in this report.

Lastly, but *certainly not* least important was the Pudong Library. Although still closed for known reasons it has been an oasis of tranquility in this fast-pace environment during the first ten months of this course. The library was a beacon. The atmosphere, modernity, facilities and collection are outstanding. Its workforce is simply extraordinary, restlessly working seven days a week from opening to closure which is not an exaggeration.

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ABSTRACT

Title of Dissertation:	Blockchain Technology; Considerations among Freight Forwarders in Shanghai
Degree:	Master of Science in International Transport and Logistics

This dissertation is an exploration of the effects of blockchain technology on the freight forwarding industry, focusing on Shanghai. While previous works on blockchain adopt conceptual approaches or zoom in on sub-sectors within supply chains, this study focuses on one specific actor. Forwarders in relation to blockchain technology are often subject to discussion however studies centering them are largely absent. This research tries to start closing that void.

An overall qualitative approach has been adopted to activate this niche of research. Seven interviews with logistics experts owning blockchain expertise were conducted to uncover the potential effect of blockchain technology on forwarders. A questionnaire was distributed among forwarders in Shanghai to measure attitudes on the ground which returned 39 responses.

Blockchain work exactly there where forwarders operate, the technology is capable to validate transactions between peers directly in a coherent pattern without the need for a coordinator in the center. In literature this starting point is used by some to explain forwarders will become redundant, others comment this center position is a chance for freight forwarders to strengthen their position. The technology allows a next phase of integration and will thus affect forwarders, regardless which scenario is followed. The ability to develop value propositions driven by blockchain and digitization will be a key factor for forwarders' future existence. It is argued access barriers might become low if the technology will be all over.

Diffusion of the technology from theoretical to practical levels in Shanghai seems limited. While experts talk about chain governance and cultural issues, practitioners refer to knowledge and technological readiness as key barriers. Forwarders do not widely consider the technology. Yet, no single respondent qualified blockchain as unimportant to be able to earn a profit in future. While experts encourage practitioners to explore and go out to see what blockchain can do, forwarders seem to be hesitant keeping a clear eye on regulators.

KEYWORDS: Blockchain technology, freight forwarders, Shanghai, intermediaries, logistics, questionnaire, interview.

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LIST OF ABBREVIATIONS

4PL	Fourth Party Logistics
AI	Artificial Intelligence
CCF	China Computer Federation
CIFA	China International Freight Forwarders Association
DC	Distribution Center
EDI	Electronic Data Interchange
FIATA	International Federation of Freight Forwarders Associations
FTC	Foreign Trade Company
GTN Ocean Portal	Global Transport Network Ocean Portal
ICO	Initial Coin Offering
IOS	Inter Organizational System
IOT	Internet of Things
IT	Information Technology
LSP	Logistics Service Provider
NVOCC	Non Vessel Operating Common Carrier
PBOC	People's Bank of China
R&D	Research & Development
REC	Research Ethics Committee
SCM	Supply Chain Management
SD	Standard Deviation
SIFFA	Shanghai International Freight Forwarders Association
SME	Small and Medium size Enterprise
SMU	Shanghai Maritime University
WCA China Global	World Cargo Alliance China Global
WIFFA	World International Freight Forwarders Alliance
WTO	World Trade Organization

Chapter 1. Introduction

The rising of freight forwarding as industry follows different origins. Reports exist about 'frachters' during Venetian supremacy who were in charge of organizing safe continental transport of the merchant and his merchandise (D'Amato and D'Amato, 1977). Ford (2001, p.3-9) wrote that freight forwarding appeared in shipping early 1800s. Personal effects of emigrants and sailors were 'forwarded' to their destination from pubs and boarding houses of East London. Then Blum (2019) explained port agents acting on behalf ship owners 'called goods forward' from agents acting on behalf of shippers; hence 'forwarding agent'. Regardless exact origin, forwarders today are known as international trade specialists providing functions to facilitate cross border movement of cargo (Murphy and Daley, in various publications).

1.1 Blockchain very basic

A blockchain is like a stack of blocks and blocks contain transactions. In turn transactions cover transfer of digital cash or transfer of tangible or not tangible items. A new block is chained to the previous block by a hash (Antonopoulos 2017, p.201). When an algorithm is run over the digitized item, it returns a 64 character hash. Thus, the hash represents the asset to be transferred, possibly in exchange for another hash (Swan 2015, p.37). Figure 1.1 provides an illustration of such a chain of blocks. Appendix I contains more blockchain terminology and explanation.

Adding blocks to the chain requires a mathematical problem to be solved by miners which does not require coordination by a centralized third party. On the contrary, in a purely distributed peer to peer system, anyone can become a node (or miner) and dispose resources (computing power) to the network (Drescher, 2017, p.141; Dobrovnik et al. 2018; Hughes et al. 2019).

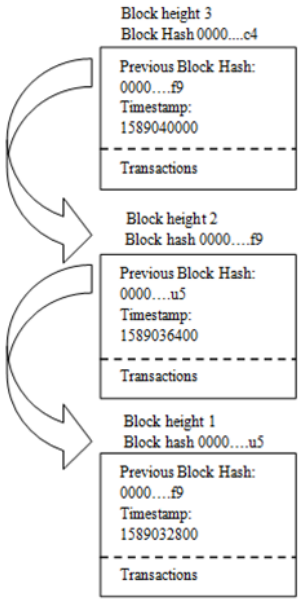

Figure 1.1 Blocks chained by hashes and time stamped based on Unix logic (seconds from January 1, 1970). Adopted from Antonopoulos, 2017

Blockchain was invented by Satoshi Nakamoto (pseudonym) in 2008. He or she mined the first bitcoin transaction in the bitcoin blockchain in January 2009. It contained the front page headline of The Times on 3 January 2009; 'Chancellor on brink of second bailout for banks'. The 64 character hash of this initial block is reflected below.

000000000019d6689c085ae165831e934ff763ae46a2a6c172b3f1b60a8ce26f

Figure 1.2 Hash of genesis block of the bitcoin blockchain

The next sections will zoom in on aim, objectives, research questions and rationale. This chapter will be concluded with a section on blockchain in China.

1.2 Aim

To explore what effect blockchain technology has on freight forwarders, with a focus on Shanghai.

1.3 Objective

The objective of this study is to understand what is going on in the forwarding industry in Shanghai in relation with blockchain technology. Additionally the study is an opportunity to learn about blockchain in shipping.

The study is forked into two. Experts were interviewed on blockchain technology in relation to freight forwarding. Secondly freight forwarders were surveyed to explore usage and impact on their businesses.

1.4 Research questions

This section will present the research questions which will be used to explore the effect of blockchain technology on freight forwarders. The study adopted the use of research questions to steer collection of data. Adding focus by posing research questions will prevent 'an overload of data and not know what to do' (Miles and Huberman, 1994, p.55). The design of research questions followed a six step process as reflected in figure 1.3

Popular books picture society broad perspectives and the impact of blockchain on global supply chains. This study will endeavor to explore implications on a much lower level by posing research questions one, two and three.

Research question 1:

To explore how and why experts believe blockchain technology will have an impact on freight forwarders.

Research question 2:

To find out if freight forwarders should be regarded as one of the species of intermediaries by some referred to as redundant in an industry surrounded by blockchain applications.

Research question 3:

Do freight forwarders consider blockchain technology?

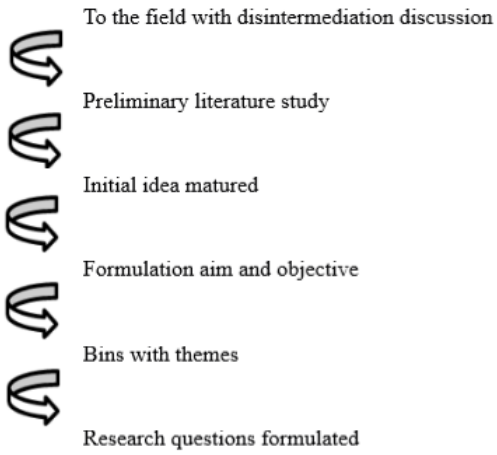

Figure 1.3 Development process of research questions

On an even more practical level Schramm (2012, p.25) identified twelve classic tasks performed by freight forwarders ranging from placing bookings with carriers to providing insurance cover on behalf of their customers. Research question four serves to answer what might be the implications of blockchain technology on specific tasks of freight forwarders. Research question five is designed to try and reveal the future value proposition of the freight forwarder.

Research question 4:

Which central tasks of freight forwarders will likely change as a result of blockchain technology and why.

Research question 5:
To identify how future business models of freight forwarders will look like when blockchain applications are available.

Finally, research question six will try to find out if and which initiatives are actually employed by freight forwarders to adapt to blockchain technology.

Research question 6:
What kind of approach do forwarding agents adopt to prepare their businesses on blockchain technology?

1.5 Rationale

There are a couple of reasons this study is deemed relevant. First, papers on blockchain in logistics discussing theoretical frameworks, emerging literature, and use cases are plentiful. This paper answers calls for (more) empirical data made by; White, 2017; Di Gregorio and Nustad, 2017; Yang, 2019; Hughes et al. 2019; Wang et al. 2018; among others. Secondly, existing work on blockchain in logistics often talk about freight forwarders but works centering them are largely absent. To my knowledge, a study (in English) combining blockchain technology in relation to the narrow focus of freight forwarding is nonexistent. Thirdly the study serves as opportunity to gain professional knowledge related to digitization in shipping.

1.6 Blockchain in China

In September 2017 China banned crypto currency exchanges and initial coin offerings (ICOs). An ICO is a tool to sell company tokens (shares). The people's bank of China

(PBOC) said ICOs ‘never obtained approval and they are illegal’ (China Daily, 2017). Since, President Xi called for regulation and a top-down approach (Foxley, 2019). To some this might be contradicting with fundamental elements of blockchain; decentralization, open, public and peer to peer. On the other hand President Xi labeled blockchain technology as a ‘crucial breakthrough point for the indigenous innovation’ (China Daily, 2019).

Chapter 2. Literature Review

This chapter will start with additional blockchain context in paragraph 2.1. Paragraph 2.2 and subsequent sections will address four constructs. First, roles and activities of international freight forwarders will be discussed together with a brief review of this industry in China. Secondly forwarders and emergence of earlier IOS applications are considered and thirdly a presentation on blockchain technology in logistics is provided. Before concluding, IT adoption in logistics in general will be addressed as well.

2.1 Additional context

2.1.1 Public blockchains, broad horizons

Centralized record keeping institutions like banks and government bodies in essence provide trust (Casey and Vigna, 2018, p.10*). Blockchains are able to replace such intermediaries by a technology which verifies transactions through algorithms instead of trust. Thus, blockchain technology is a way to facilitate trust between strangers. Figure 2.1 shows a centralized system of ledgers versus a distributed system.

Often the first and probably most cited business identified as candidate for the application of blockchain technology is the financial industry. Blockchains allow instant settlement of financial transactions between peers. People in undeveloped countries are able to participate in an economy without going through intermediaries. In data rich countries individuals are better able to protect their privacy by releasing only that piece of data required to complete a transaction (Tapscott and Tapscott, 2018, p.59*, Casey and Vigna, 2018, p.187*).

* ***Book downloaded from the web; page number in hard-copies might differ***

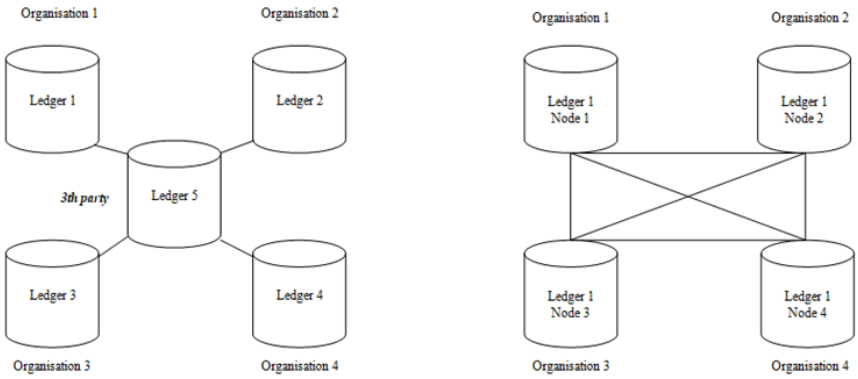

Figure 2.1 Central system versus distributed (blockchain) system.
Adopted from Lacity, 2018

2.1.2 Public versus private blockchains

There is a difference between public (permissionless) and private (permissioned) chains. Public chains do not require an on-boarding process. Anyone can join. The bitcoin and ethereum blockchains (digital currencies) are examples of public chains. Members of a private blockchain have gone through a procedure. For this reason blockchain purists prefer to label private chains as 'distributed ledger technology', or anything similar rather than a blockchain (Drescher 2017, p.246). Barker et al. (2019) uncover an ongoing discussion about the definition of blockchain. According to Drescher (2017, p.217) it will be the private blockchains which are most useful in commercial context. Still, Casey and Vigna (2018, p.160-161*) among others argue that private chains may have their place in the early stages of technology development; it will be the public chains provoking creativity, enthusiasm and passion which will ultimately lead to inclusion and adoption by public at large. One condition, regardless private or public is adaptation of common standards for that chain, enabling communication between members.

2.1.3 Blockchain in supply chain management

Next to the financial industry, Tapscott and Tapscott (2018, p.38*) qualify supply chain management (SCM) as prime candidate for blockchain applications, because the industry is 'not overhauled in years'. Melanie Swan (2015, p.x) explains that digitizing tangible and intangible assets allow these items to be transacted on the blockchain. This would permit 'intermediary free transactions across industries on a global basis'.

Mougayar (2016, p.109*) argues that the blockchain will enable full transparency of products' roots, quality and authenticity. Moreover, 'dealers and brokers not offering blockchain enabled transfer are under threat'. Supply chains are defined by Casey and Vigna (2018, p.133*) as independent businesses maintaining silo's of information. They claim visibility across actors can be improved by using blockchain applications.

Next paragraphs will explore activities, evolution and previous emerging IOS's in relation to freight forwarders. After addressing blockchain technology in logistics and shipping, a brief section will discuss adaption of ICT tools in logistics and forwarding.

2.2 Freight forwarders evolution and current activities

Literature for this construct of the review primarily has been sourced from the EBSCO-host database. A summary of parameters and search results is provided in table 2.1

On top of this selection three PhD theses related to freight forwarding and one book were used. The search term with the highest returns ('freight forwarder') has also been used to check Web of Science, ACM library, Emerald, IEEE, Science Direct and Wiley, these databases returned less and duplicate results. Due to limited search functions in Springer Link, too little or too much results were returned. That database has not been used.

Table 2.1
EBSCO search parameters for literature review construct freight forwarder

In	Search Term	Returns after First Refinery[a]	Returns after Second Refinery[b]
'TI' or 'AB'	Ocean Freight Forwarder	7[c]	4
'TI' or 'AB'	Ocean Freight Forwarding	1[c,d]	0
'TI' or 'AB'	Ocean Forwarding	1[c,d]	0
'TI' or 'AB'	Sea Cargo Forwarding	13[c,d]	0
'TI' or 'AB'	Freight Forwarder	248[c,d]	10
'TI' or 'AB'	International Freight Forwarder	34[c,d]	2
'TI' or 'AB'	International Freight Forwarding	17[c,d]	1
'TI' or 'AB'	IFF	1620[c,d]/skipped based on first page scan	
'TI' or 'AB'	Freight Forwarding Agent	5[c,d]	0

TI; title AB; abstract

[a]First refinery; returns based on search terms in text

[b]Second refinery; title and abstract scanned

[c]Peer reviewed checkbox switched on

[d]Duplicate returns from previous search parameters excluded

Five out of 17 articles dropped after reading

2.2.1 Definition and activities

Freight forwarders are often labeled 'architects of transport' (Schramm, 2012, p.24, Blum, 2019, FIATA, 2020). Murphy and Daley who wrote a variety of articles on international freight forwarding, use a more comprehensive definition of a freight forwarder; 'an international trade specialist who can provide a variety of functions to facilitate the movement of cross-border shipments'.

Schramm (2012, p.25) listed 12 functions of a forwarder, ranging from consultancy to supervision. Murphy et al. (1992) conducted a literature review and listed most frequently cited tasks of the freight forwarder. The list was headed by issuing export declarations, obtaining insurance and reservation of vessel space.

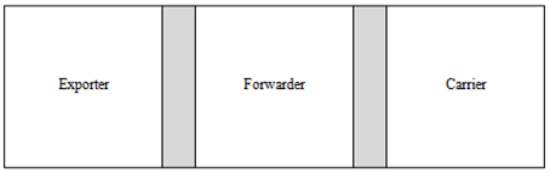

Figure 2.2 Obvious boundaries between export actors before containerization and deregulation. Adopted from Davies, 1981

Containerization, trade blocks and harmonized export procedures (Davies, 1981; Schramm, 2013, p.74) made cross border movement of goods easier. Davies predicted that unification would integrate actors who were acting along strict company boundaries before that as reflected in Figure 2.2

Despite environmental challenges and pressures from various sides over the past decades the freight forwarder still exists. Westfall says; 'exporters shy away from complicated international shipments' (Westfall, 1987, p.59). Although this seems simple and outdated it is repeated by Delaney (2016, p.344). She recommends a forwarder to exporters as 'all round transport agent, saving time, efforts and anxiety'.

Table 2.2 reflect services provided by forwarders as surveyed by Westfall in 1987 (from most common to least offered), most cited services as per literature review by Murphy et al. 1992, forwarders functions identified by Schramm in 2012 and activities expected from exporters as identified by Delaney in 2016.

2.2.2 Freight forwarding in China

Before 1978 the central government operated a strict plan based economy. Based on five year horizons factories were told what, where and how much to produce. Output was distributed to the population in a three tier system (Zhang and Figilozzi, 2009). Foreign

trade was regulated through Foreign Trade Companies (FTCs) licensed to import and export. The China National Foreign Trade Transportation Group Corporation (Sinotrans),

Table 2.2
Freight forwarders services, functions and customer expectations

1987	1992	2012	2016
Most common **services**	Most cited **services** in	Freight forwarders **functions**	Exporter **expectations**
offered, survey by Westfall	literature by Murphy et al.	proposed by Schramm	by Delaney
Warehousing and storage	Issue export declaration	Consultancy function	Handle all shipping arrangements
Make transportation arrangements	Obtain insurance	Packaging function	based on customer specs
Container shipment services	Obtain vessel space	Clearance function	Take legal responsibility
Tracing of missing shipments	Prepare consular invoice	Documentary function	Pay up-front costs
Obtain custom clearance	Compile Bill of Lading	Affreightment function	Arrange for carrier at factory door
Consolidation services	Arrange warehouse space	Consolidation function	Book space with carrier
Provide Bill of Lading	Act as export consultant	Insurance function	Handles all documentation
Handle reverse distribution	Present document to the bank	Logistics function	Arrange insurance
Initiate claims filing	Quote rates	Fiduciary function	Present documents to bank
Packing services	Compile air way bill	Supervision function	Suggest packing adjustments
Financial services	Collecting and submitting funds	Quasi banking function	Arrange pre/on carriage
Provide export license	Provide pre/on carriage	Transport function	Takes responsibility to meet
Provide pilot pick up	Legal counseling		intended vessel
Provide notice of availability	Export packing		Monitors shipment from start to finish
Inspect material upon receipt	Consolidator		keeps customer updated throughc
at facilities	Prepare comm. Invoices		
Obtain insurance	Obtain export license		
Report discrepancies	Prepare certificates of origin		
	Pay freight		
	Obtaining dock receipts		
	Trace shipments		
	Advise on terms of sale		
	Provide routing recommendations		
	Break bulk services		

Adopted from Westfall (1987), Murphy et al. (1992), Schramm (2012) and Delaney (2016)

a state company established in 1950, acted as sole operator for transport and freight forwarding (Buckley, et al. 2005). From 1978, Deng Xiaoping pursued economic reforms and followed a path of opening up (Vogel, 2011 throughout). It took until mid

1980s before provinces and municipalities engaged in foreign trade by setting up joint ventures with foreign companies and around the same time Sinotrans was joined by its first competitor (Lu and Dinwoodie, 2002). Any restriction on foreign participation in freight forwarding was lifted in 2005, when the transition of China to full WTO member was completed (Chen and Lee, 2013; Liang et al. 2019).

2.3 Forwarders and new technologies

This section will address some of the new technologies freight forwarders have faced during the past decades. Schramm (2012, p.40) observed two major technological 'revolutions' in transport over the last 60 years. He distinguishes between the 'cargo handling revolution' (unitization and containerization) and 'information processing revolution'. Here the second revolution will be addressed only. This look back in time is offered to place blockchain in perspective with previous IOS's. Next paragraphs will talk about development of electronic data interchange (EDI) and internet in relation to forwarding.

2.3.1 Forwarders and EDI

The EBSCO database was used to source literature again. Search parameters, returns and number of selected papers are reflected in table 2.3

Table 2.3
EBSCO search parameters for literature review
construct EDI and freight forwarders

In	Search Term	Returns after First Refinery[a]	Returns after Second Refinery[b]
'TI'	EDI AND freight forwarder	130[c]	7
'TI'	Electronic Data Interchange AND freight forwarder	99[c,d]	1

[a]First refinery; returns based on search terms in text

[b]Second refinery; title and abstract scanned

[c]Peer reviewed checkbox switched on

[d]Duplicate returns from previous search parameters excluded

EDI enables electronic transfer of data between organizations in a standardized manner. It is reported that EDI messages were first used in 1965 by the Holland America line transmitting manifests (McCarthy, 2013). Wide commercial adoption started during the late 1970s and early 1980s. EDI messages are standard and are made up of predefined segments. Messages are converted from in house systems to agreed EDI standards (and the other way round). One such message used in shipping, among many others, is reflected in figure 2.3. It shows a partial screenshot of a container loading order.

Bellego (1991) commented cross border movement of cargo involves 30 to 40 different documents requiring manual input at every stage. EDI could eliminate duplicate input and the technology has the potential to enable paperless international trade he reasoned. In their 1996 study Murphy and Daley noted EDI is crucial for future existence of forwarders. They predicted that laggards might be forced to leave the industry. Respondents in their survey recognized potential of EDI as well, 75% of forwarders found that EDI is an important tool for success.

Figure 2.3 Partial screenshot of a coprar load EDI message. One 20' (2200) container traveling from Hamburg (DEHAM) to Bangkok (THBKK) via transhipment in Singapore (SGSIN). Verified gross mass (VGM) 14350 kgs Adopted from smdg.org, 2018

Benefits and barriers related to implementation and use of EDI by forwarders and logistics service providers identified by Bellego, 1991; Williams, 1994; and Murphy and Daley, 1996 are summarized in table 2.4.

Table 2.4
Perceived benefits and obstacles in shipping and forwarding when EDI emerged

Benefits	Obstacles
Reduction of clerical cost	Lack of standardization
Avoid duplicate data input	Implementation of conversion software required
Improves accuracy of transactions	Electronically transferred documents lack legal status
Fast and effective communication	Lack of suitable telecommunication media
Speeds up procedures	Investment in hard and software required
Improves efficiency of processing cargo manifests, customs	High set up cost
entries, certificates of origins, import/export licenses, etc.	Lack of customer sophistication
Facilitates strategic ties between organizations	Lack of awareness of benefits
Quick access to information	Shift in corporate culture required
Better customer service	
Increases productivity	
Enables competitive advantage	

Summary based on Bellego (1991), Williams (1994) and Murphy and Daley (1996)

2.3.2 Forwarders and the internet

While authors were discussing EDI and impact on forwarding and logistics early 1990s, the world-wide-web had became a mass medium in no time (Hughes, 1999 p.179). For forwarders who just got used to EDI, the internet posed a next challenge. Table 2.5 shows EBSCO search parameters, returns and number of articles used in relation to freight forwarders and the internet.

It was noted by Bollo and Stumm (1998) that due to the speed of data transmission it is possible to publish color pictures and sound bites. In business, the web could function as ‘digital yellow pages’. Simultaneously the authors recognized the web’s potential. They

predicted internet would allow carriers to form a more direct link with shippers and shippers were able to perform tasks previously performed by intermediaries themselves.

Table 2.5
EBSCO search parameters for literature review
construct internet and freight forwarders

In	Search Term	Returns after First Refinery[a]	Returns after Second Refinery[b]
'TI'	Internet AND freight forwarder	216[c]	3
'TI'	World wide web AND freight forwarder	25[c,d]	0
'TI'	E-commerce AND freight forwarder	78[c,d]	2
'TI'	Ecommerce AND freight forwarder	16[c,d]	1
'TI'	Electronic commerce AND freight forwarder	62[c,d]	1

TI; title

[a]First refinery; returns based on search terms in text

[b]Second refinery; title and abstract scanned

[c]Peer reviewed checkbox switched on

[d]Duplicate returns from previous search parameters excluded

Two out of seven articles dropped after reading

More or less similar predictions were expressed by Clott (2000) and Murphy and Daley (2000). They noticed that internet threatened the traditional way of doing business by intermediaries in logistics. Due to the ability of customers to interface with suppliers directly, middlemen would become obsolete without adding value by new means. These authors perceived an opportunity for those intermediaries skilled enough to assume a new role in a network character economy. A little later in 2002, Stopford commented on emergence of e-commerce in shipping as 'another step along a well-trodden road'. Indicating that development of communication technologies started centuries ago with the ability to send telegrams. Benefits and barriers of internet for forwarders and logistics service providers identified by Bollo and Stumm, 1998; Clott, 2000; and Murphy and Daley, 2000 are summarized in table 2.6.

Table 2.6
Perceived benefits and obstacles in shipping and forwarding when the internet emerged

Benefits	Obstacles
Low operating cost	Safety and security issues
Globally available	Tampering of messages
Open	Learning and training will take time
Easy to use	Customer inability to implement usage
Lower entry/operating barriers compared with EDI	Forwarder inability to implement usage
Intranets enable electronic exchange of data between companies	Lack of uniform transaction standards
Enables additional service offerings for forwarders and carriers	Unreliable delivery of information
Quick access to information	Problem with hard or software
Improves communication with customers	Time spent on non work related activities
Improved customer service	Resistance with customers
Reduces paperwork	Resistance with forwarders
Improves productivity	Lack of management support

Summary based on Bollo and Stumm (1998), Clott (2000) and Murphy and Daley (2000)

Anderson and Anderson (2002) witnessed claims that the internet would cut out intermediaries and explain why this did not happen. It is recognized by them that e-commerce enables customers to 'go direct' and intermediaries who do not adapt have little future. They commented intermediaries are in the market to solve problems for the buyer and consequently solve another problem for the supplier. This would explain why sophisticated shippers nowadays negotiate freight and conditions with carriers directly but let daily communication and arrangements (problem) with their 'forwarder'.

2.4 Blockchain technology in logistics and shipping

Literature (journal papers and periodicals) in English language exclusively dedicated to blockchain and freight forwarding are scarce, if any. Most work discusses blockchain in relation with supply chain management and logistics with references to intermediaries. Table 2.7 reflects the EBSCO search returns. Due to modest result, individual databases

mentioned earlier were consulted as well. This yielded another seven papers, 13 papers used during the preliminary literature study were added.

Table 2.7
EBSCO search parameters for literature review construct blockchain and freight forwarders

Search Term	Returns after First Refinery[a]	Returns after Second Refinery[b]
Blockchain in 'TI' AND freight forwarder in 'TX'	1[c]	1
Blockchain in 'TI' AND freight forwarder in 'TX'	46[d,e]	3
Blockchain in 'TI' AND logistics in 'AB'	33[c,e]	7
Block chain in 'TI' AND logistics in 'AB'	0[c,e]	0
Block-chain in 'TI' AND logistics in 'AB'	0[c,e]	0

TI; title TX; text AB; abstract

[a]First refinery; returns based on search terms

[b]Second refinery; title and abstract scanned

[c]Peer reviewed checkbox switched on

[d]Peer reviewed checkbox switched off

[e]Duplicate returns from previous search parameters excluded

Three out of eleven articles dropped after reading

2.4.1 Supply chain management and logistics

Besides the authors of popular books cited earlier, Hughes et al. (2019) indeed found that SCM is most frequently discussed as application for blockchain technology in the broad field of logistics. Barker et al. (2019) concluded similarly in their research review on blockchain. Papers from logistics perspective include Dobrovnik et al. (2018) and Tönnissen and Teuteberg (2019). The former recognizes blockchain technology as master record for transactions. The latter suggests 'blockchain service providers' might emerge.

Shipping

According to Kshetri (2018) and Yang (2019) blockchain can digitally exchange the myriad of cross border trade documents in shipping; fast and reliable. The former author adds that 'by eliminating middlemen in supply chains, efficiency can be increased and costs can be lowered'. But are freight forwarders among the species of intermediaries vulnerable for elimination? As mentioned earlier freight forwarders are the international trade specialists organizing and coordinating documentation and transactions (Schramm, 2012, p.24, Blum, 2019, FIATA, 2020). It are exactly these architects dealing with the documents and data (bill of ladings, booking confirmations, commercial invoices, certificates of origins, dangerous goods declarations among many more) targeted being encoded on the blockchain (Lehmacher and McWaters, 2017; Groenfeldt, 2017; Yang, 2019; Hackius and Petersen, 2017; Loklindt et al. 2019; Shi and Wang, 2018; Tönnissen and Teuteberg, 2019; Norberg, 2019)

The selection of papers did not result in a clear picture what blockchain might bring. Yang (2019) recommends early adoption of blockchain technology by actors in the maritime field, among others freight forwarders. Using such a disruptive technology earlier then competitors will provide a 'higher degree of competiveness'. Shi and Wang (2018) predict an overall 'farewell' for freight forwarders, shipping brokers, maritime lawyers and other intermediaries. Elimination of third parties in shipping is also predicted by Szewczyk (2019). Jugović et al. (2019) see the peer to peer character of blockchain as driver for disintermediation in shipping. Much of the same reason for 'dispensation' of intermediaries is expressed by Meyer et al. (2019). Equality of users in a blockchain environment eliminates the need for supervising entities and thus dispensation is expected. Lastly, Nordberg (2019) views international trade as a long chain of transactions linked by specialized but costly and inefficient middlemen. Middlemen are 'not a perfect solution for the problem'. She adds intermediaries are costly and inefficient.

On the other side there is a group of authors, who report chances, transformation and the potential emergence of an additional type of intermediaries. One of the conclusions of a study on digitization of shipping documents by Loklindt et al. (2019) is that parties central in the supply chain could be among the main beneficiaries of blockchain technology. They predict 'vast gains' for carriers and forwarders through digitization. Tönnissen and Teuteberg (2019) in their analysis of blockchain for supply chain systems estimate that blockchain technology in ocean freight context does not allow disintermediation. Only few of the functions currently performed by intermediaries match functions of permissioned blockchain systems they write.

Some authors link the peer to peer character of blockchain technology with a terminating role of intermediaries such as freight forwarders. Others predict a shifting landscape and an opportunity for specialized operators, complicating things rather than simplifying them.

2.4.2 Benefits and barriers

Benefits and barriers for forwarding are difficult to distillate. They are often presented in broad contexts and without specification which benefit or barrier belongs to which industry actor. One of the benefits in shipping pictured by Bavassano et al. (2020) indicates a 40% saving on delivery time and a reduction of 5% on transport costs when applying blockchain technology. Yang (2019) foresees an overall reduction of delay without reference to where and what kind of delay. An 'overall improvement' of quality is to be expected in supply chains when applying blockchain according to Helo and Hao (2019). Cost is a development barrier for Juma et al. (2019). Helo and Hao (2019) state implementation costs are low. Some authors qualify elimination of intermediaries as benefit (Norberg, 2019; Jugović, 2019; Shi and Wang, 2018).

Common cited benefits include reduction and easiness of paperwork, fraud reduction, increased transparency in (complicated) supply chains and facilitation of trust between strangers. Often cited barriers include varying legal requirements in different geographical regions, little knowledge among industry actors, lacking interoperability, lacking global standardization, cultural resistance among others. Table 2.8 provides an overview of broadly categorized benefits and barriers based on the literature studied here.

Table 2.8
Benefits and obstacles of blockchain technology

Benefits	Obstacles
Increases transparency	Fragmented legal requirements across geographies
Simplifies/reduces paper based processes	Lack of system standardization
Reduces fraud	International character of shipping
Reduces transaction costs	Interoperability of blockchains
Facilitates trust between strangers	Limited knowledge and technological readiness
Increases cyber security	Cultural resistance
Enables tracking of products from their very source	Lack of governance
Able to connect IoT devices/applications	Benefits not clear

Summary based on Bavassano et al. (2020), Hackius and Petersen (2017), Helo and Hao (2019), Jugović et al. (2019), Juma et al. (2019), Loklindt et al. (2019), Meyer et al. (2019), Nordberg (2019), Shi and Wang (2018), Szewczyk (2019), Tönnissen and Teuteberg (2019), Van Hoek (2019),

2.4.3 Practical tool

Van Hoek (2019) recommend businesses to conduct small scale pilots with few participants focused on adding true value. For example reduction of custom clearance process time. He suggests that data obtained from other systems enhances blockchain applications. Through blockchains, such data will be available wider and faster.

2.4.4 Delivering value

A ‘huge’ gap between promised and actual value is identified by Lacity (2018). Without a specific number Iansiti and Lakhani (2017) believe it will take decades before blockchain will ‘transform’ businesses. These authors consider the technology as foundational rather than disruptive. According to them disruptive technologies are driven by new alternatives which cost less to do the same thing. Lower cost solutions attempt to take over existing firms. Foundational technologies however have the potential to create new foundations for the economy.

2.5 ICT adoption in logistics

Adoption of ICT applications in the freight transport industry is qualified ‘immature’ by Marchet et al. 2009. The industry has difficulties to identify potential benefits of IT solutions. The fragmented nature of the transport industry forms a second barrier to invest in such tools they argue. Poulis et al. (2011) and Lai et al. (2005) explain that despite benefits of IT tools, SMEs have difficulties to adopt due to limited resources. The latter authors discovered that ‘fear of changing the way to do things’ is among the top barriers preventing implementation of new technologies as well. Carlan et al. (2020) also observed a fragmented industry which leads to inefficient cargo, financial and information flows. They identified four categories of IT integration barriers among maritime supply chain stakeholders; economic, legal and political, technological and cultural. Similar to Lai et al. (2005) managerial issues are among the most significant barriers as well.

In mainland China, guanxi is considered a critical factor in technological innovation by LSPs. Chu et al. (2018) explain that personal relations are crucial for companies who act in the center of a web with other stakeholders. Guanxi facilitates innovation through access to scarce resources and information. Technological innovation in the logistics

sector in China is often reactive and based on customer requirements neglecting own initiatives the authors comment.

2.6 Conclusion

Figure 2.4 gathers the major issues from this chapter. On the x-axis there is an imaginary basket of forwarders capabilities. In the early days of freight forwarding the basket was small. Predominantly forwarders had a narrow task and few tools were required to execute them. Over time (y-axis) the basket expands as more capabilities are added.

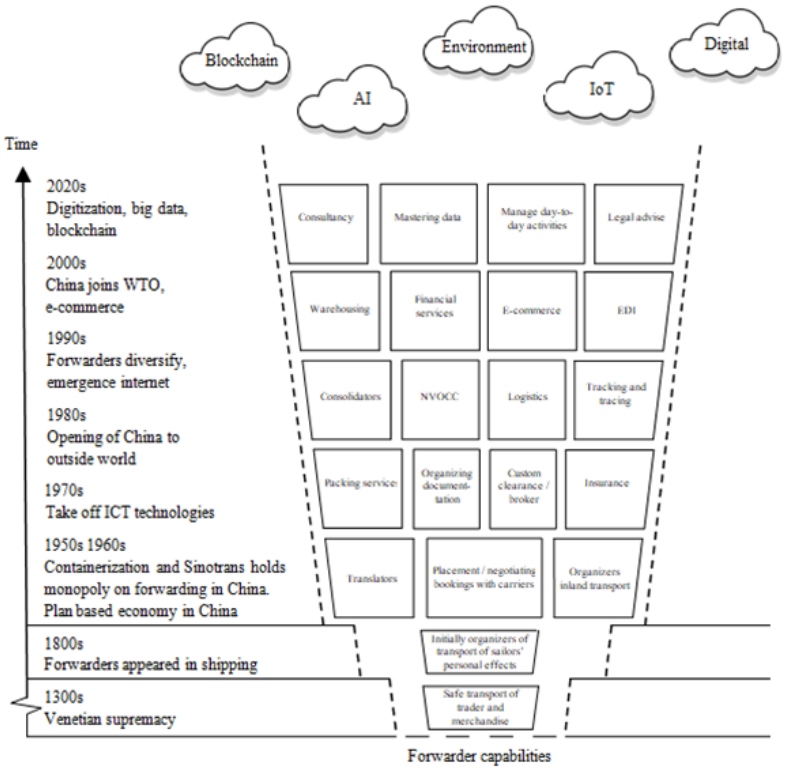

Figure 2.4.Freight forwarders expanding basket of capabilities

The basket is not water tight and some capabilities drop(ped) out. In general however it seems, more tasks and capabilities are added then removed. New phenomenons continue

to appear on the horizon. According to some blockchain has the capability to dispense costly and inefficient intermediaries, while others see chances. Clearly, an unequivocal picture is absent.

Chapter 3. Methodology

Because of its simplicity the three tier construction proposed by Coles and McGrath (2010, p.79) was used to design the study. The three levels move from abstract on the top (methodology) to practical on the lowest level (data collection tools). Research strategy is in the middle, figure 3.1. The research methodology was mainly qualitative; the research strategy was that of a survey and the methods used for data collection were interviews and questionnaires. Paragraph 3.1 will motivate the methods at every level. After outlining data analysis a detailed presentation of the actual data collection process is provided. A short conclusion will be available at the end of the chapter.

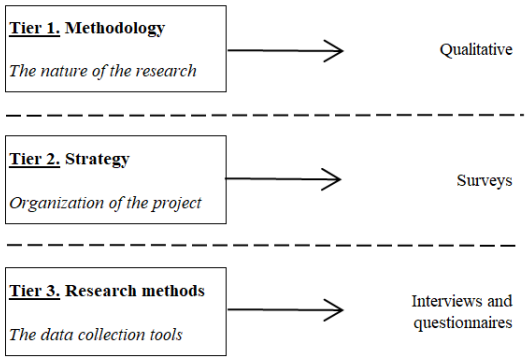

Figure 3.1 Design of the study

3.1 Research approach

First level, qualitative nature

The first and most abstract level is shaped by the overarching structure of the study. Coles and McGrath call this the research methodology. Cohen et al. (2018) use the term research design and distinguish between quantitative, qualitative, ideological critical or a combination; mixed methods research. Each of these designs are born from different

ways of looking at the world and rest on different assumptions 'what the world is like and how we can understand or know about it' (Cohen et al. 2018, p.8). The authors identify three broad approaches which are linked to research designs; positivist approach, interpretive approach and critical theorist approach.

The project aims on a niche in research of blockchain by exclusively focusing on freight forwarding. Because that area is uncultivated an overall qualitative approach has been adopted. This will allow generating an in depth understanding of beliefs on the effect of blockchain in forwarding. Observable behavior, data and repeatable experiments related to blockchain and freight forwarders are not available; consequently an overall quantitative approach does not fit. Later, when technology and adoption are matured, perhaps quantitative approaches serve this purpose best.

The qualitative nature of this study will also serve experts and practitioners best. For experts, results of practitioner inquiries provide an opportunity to understand the state of development of blockchain 'on the ground'. For practitioners, the expert views are a chance to estimate consequences of blockchain technology for their industry.

Second level, surveys

The second level concerns the research strategy. Bell (2005) calls these strategies, 'approaches'. Cohen et al. (2018) name them 'methodologies'. Table 3.1 lists the various 'strategies', 'approaches' and 'methodologies' identified by Coles and McGrath; Bell and Cohen et al.

After surveys, case studies are probably the second best strategy for answering the research questions. Case studies are detailed examinations of a person or phenomenon. It could look in depth at freight forwarding businesses engaging with blockchain technology. However, language could be problematic when trying to generate (and

understand) genuine perceptions. It is expected that the population of freight forwarders engaging in blockchain technology is small, which might result in access issues as well.

Table 3.1
Research strategies by Coles and McGrath, Bell and Cohen et al.

Coles and McGrath 'strategies'	Bell 'approaches'	Cohen et al. 'methodologies'
Case studies	Case studies	Case studies
Action research	Action research	Action research
Surveys	Surveys	Surveys (various types of)
Ethnography	Ethnography	Qualitative and ethnographic research
Grounded theory	Grounded theory	Experiments
Phenomenology	Experiments	Historical research
	Narrative inquiries and stories	Trend studies
		Meta analysis
		Systematic reviews
		Naturalistic research

Coles and McGrath (2010) 'strategies' are termed approaches by Bell (2005) and methodologies by Cohen et al. (2018)

Surveys are conducted because these will help to answer the how and why issues from the research questions by inquiring experts and practitioners. Surveys will assist to draw a rough picture of the effect of blockchain technology on freight forwarders and it provides an opportunity to scan a wide field of issues among experts and practitioners (Cohen et al. 2018, p.334). Moreover they are efficient and will generate the information on this uncultivated area, which can be explained, described and analyzed. Lastly, the questionnaire assists to generate numbers to be processed statistically. These numbers will help to add quantitative elements to the study. By asking the same question to different people comparisons can be made between sub samples in the questionnaire for example based on company demographics. For all those reasons surveys are the best fit for this specific study.

It is acknowledged that data collected through surveys represent a snapshot in time. Attitudes, opinions and perceptions of participants might change overnight. However, the practitioner survey focused on forwarders in Shanghai, aims to yield large scale data which will enable to make generalizations about queried variables (Bell, 2005, p.12-14, Coles and McGrath, 2010, p.88-90, Cohen et al. 2018, p.334). Findings might be relatable to similar places for example other Chinese ports.

Third level, interviews and questionnaire

The study will use interviews and questionnaires to collect data. This allows to look at the effect of blockchain on forwarders from different perspectives. A questionnaire will not do justice to experts and interviews are not suitable to query practitioners when taking into account the vast population of forwarders in Shanghai. Moreover the questionnaire will enable to create a first and rough picture on the effects of blockchain on forwarders in Shanghai.

Interviews

Interviews are considered the best fit because these offer the opportunity to understand potential effects of blockchain on freight forwarding from the lived daily world of experts (Kvale, 2007, p.27). Experts here are professors or researchers with combined knowledge of the maritime field or logistics and blockchain technology. Experts will be the guide to unknown territory and through interviews it will be possible to obtain in depth beliefs and motivation.

Initially the target was set on Chinese experts because these were considered to be in the best position to provide Chinese insights. Paragraph 3.3 will come back to this. A maximum of ten interviews was set. This number is deemed sufficient for a first and general exploration.

Questionnaires

In this research, questionnaires are a better fit over observations, tests and other tools because they will allow drawing a first and general picture among forwarders of their attitudes on blockchain technology. Questionnaires put least constraints on respondents and can be analyzed relatively straight forward. Research question themes are linked to survey questions directly. The disadvantage mentioned by Cohen et al. (2018, p.471) that a questionnaire yields 'superficial data' is considered a supplementary motivation for the use of questionnaire in this case. The study is not looking for fine grained data; rather it attempts to obtain a first and rough picture. As indicated above the questionnaire also serves as source for numbers. More precisely, ordinal scales will be presented to respondents to measure attitudes and beliefs.

The large population of forwarders in Shanghai supports the use of a closed questions questionnaire. Although large populations do not necessarily signify the use of a large sample. Tan et al. (2014) remarked that the overall respond rate on surveys in China is low. For all these reasons a questionnaire is the best fit to explore perceptions of blockchain technology among forwarders in Shanghai.

Question design

The preliminary and formal literature reviews were used to identify main themes surrounding blockchain technology and freight forwarding. This knowledge was used to design a semi structured interview. During construction of interview questions a time limit of 30 minutes was kept in mind to avoid collecting too much information.

As for the questionnaire a similar approach will be used. However, the analysis stage was kept in mind more prominently as recommended by Cohen et al. (2018, p.473) and Bell (2005, p.136). By querying certain company demographics it was hoped for

example, that these variables would explain potential differences in responses to dependent variables.

Always, main themes from both literature studies were linked to main themes from the research questions and interview/questionnaire questions. Figure 3.2 outlines this idea with research questions on the left linked to interview and questionnaire questions on the right. The illustration depicts the idea; actual links are not displayed for clarity sake.

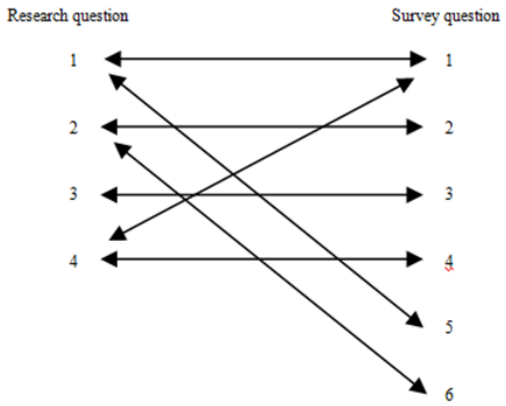

Figure 3.2.Linking research questions and survey questions
Adopted from Coles and McGrath (2010)

3.2 Data analysis

Similar to the survey design stage, the research questions formed the basis for interview and questionnaire analysis. In line with this construction the findings section of this report (next chapter) is constructed based on a discussion of research questions one after another. If discoveries were made relating to a particular research question after the question was addressed however, these were considered as well. The next two sub sections (questionnaires and interviews) will present the steps taken from the moment the data was collected till reporting. Cohen et al. (2018, p.643) recommend to do this as transparent as possible in order to display how key points are derived from subjective

participants. That is what will be attempted in the next sections. Data analysis was cut in pieces and stages are reported here.

Questionnaires

1. Editing

Hard copy surveys were checked on accuracy and errors. Two returns were abandoned due to missing answers. Surveys completed online did not have to be checked on these items, the option to submit incomplete surveys was not enabled.

2. Management

A Microsoft excel sheet was created in which responses (hard copies and excel exports from online respondents) were consolidated. The number of responses (paragraph 4.1) allowed maintaining a reasonably clear overview.

3. First light scan

While merging responses in one file, first impressions were absorbed. Answers to crucial questions were given extra attention. Notes were taken for items of interest which served as start for the main stage analysis. The questionnaire contained two questions which gave respondents the opportunity to provide an answer others then listed, this option was never used.

4. Summary sheet

After merging the data in one file a summary sheet was composed to consolidate frequencies. The resulting overview offered additional ideas to be checked during the detailed stage of analysis.

5. Thorough analysis

Based on the items noted during the first and dirty analysis a start was made to explore information in greater detail. Key questions were linked with company demographic characters and replies to scale questions weighing to one side were considered as well. Classifications were created for answers to questions which asked respondents to assign their level of agreement or importance to issues on the same question. For example, respondents were asked to assess importance of presented benefits on a five-point Likert scale. The aggregated responses then allowed creating a ranking of benefits deemed most important. Such classifications were then used to see if different or similar replies were given among sub samples.

All the time the option to respond to emerging patterns differences or other issues worth checking was left open. Additionally, it was attempted to keep in mind work of other authors, admittedly however this was not always the first reflex.

Presence of statistical significance was measured among sub samples on a variety of variables. Most often company size and age served as differentiators. Next to t-tests, relations between certain company demographics and various dependent variables were explored using the Spearman's rank correlation test.

6. Reporting

During this stage, relevant data from stage 5 was drawn together per research question. Tables and figures were created and items considered most important to answer the research questions were reported. During this stage previous literature occupied a prominent place.

Interviews

Similar to questionnaires the groundwork for analysis of interviews was done at the moment when interview questions were developed. The next sub sections will outline in detail how interviews were transformed to this report.

1. Recording

All interviews were conducted online (Wechat or Skype) and audio was enabled only. For this reason visual and non verbal aspects were absent. One interview could not take place due to a technical issue; the interviewee answered questions in writing. Questions were shared with the interviewees a couple of days before the interview. All interviewees agreed to record the conversation. Audio's were not only used to transcribe to interview but also served as tool to go back and listen to emphases and tones.

2. Transcripts

Transcripts were produced right after the interview and a first light analysis was done after transcription. Any remarkable statements or issues of particular significance were highlighted here.

3. Thorough analysis

According to Kvale (2007, p.103) no one standard method exists to 'arrive at essential meanings of what is said in an interview'. Instead, he proposes some common tools to analyze transcripts. Broadly these tools are divided in foci based on 'meaning' and 'language'. Under these tools Kvale distinguishes between several approaches. Analysis of the interviews conducted for this study could best be labeled as a combination of 'coding' and 'condensation' (Kvale, 1996, p.187) while leaving other (not) prescribed ways open. In doing so it is hoped to catch unexpected and varying statements inherent to the explorative nature of this study.

Once all interviews were finished transcripts were printed, answers were taken apart and stacks of answers appeared. Key words (codes) from the research and interview questions were attached to statements of interviewees. Where possible these statements were condensed to shorter formulations. Sometimes replies to questions did not follow that question but emerged at another moment. This made the stacks of answers subject to constant shuffling. The use of condensed items will be limited to tables. Interview quotes will be used where possible so not to lose valuable accentuations as well as not to stuff the findings chapter with too much data.

4. Report and verification

After this main stage of interview analysis, findings were drawn under their particular research question in a similar way as described in stage 6 of questionnaire analysis. To prevent the statements from stripping what was really said (stage 3), all audio's were replayed here. When necessary, amendments were processed.

The division of questionnaire and interview analysis in steps described here should be considered as rough framework. In reality this division did not always hold and the process sometimes turned out messy.

3.3 Data collection in practice

This section describes how, when and from whom data was collected starting with a timeline from literature review to submission of this report in figure 3.3. Approval from the university's research ethics committee (REC) for participation of human subjects was requested and granted in March 2020 (copy in appendix II).

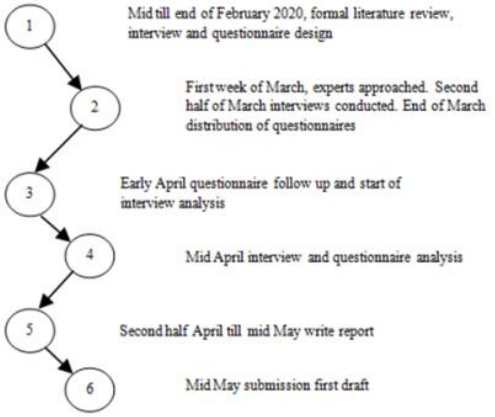

Figure 3.3 Timeline from literature review to submission first draft

Organization of interviews

In March one week has been reserved to approach Chinese interview candidates. Face to face interviews were abandoned due to the virus. Online interviews were pursued instead. During that week blockchain research centers across China, blockchain startups and maritime stakeholders in Shanghai and prominent maritime oriented universities were approached. These included but were not limited to Dalian maritime university, Zhejiang university, Jimei university and Shanghai maritime university. Members of the blockchain professional committee of the China computer federation (CCF) were approached as well. Besides, Chinese maritime economists whose contact details were available on the web or in publications were contacted. Over 140 invitations were distributed which resulted in one interview candidate. Then it was decided to expand horizons by approaching foreign experts. This drifted focus away from Shanghai, However forwarding is considered an international occupation therefore the move is deemed justifiable. Seven interview candidates were found fitting the profile. Six interviews were finally conducted. The seventh interview could not take place for reasons mentioned earlier. Table 3.2 provides the location and title of interviewees linked to an ID.

Table 3.2
Summary of experts

ID	Title and Specialization	Location
E1	Doctor. Logistics and operations management	Europe
E2	Professor. Director maritime logistics research center	China
E3	Professor. Logistics	Europe
E4	Professor. Supply Chain Innovation	South East Asia
E5	Chair professor, maritime policy	China
E6	Doctoral candidate (written feedback only)	Europe
E7	Senior researcher at a shipping research institute	Europe

The inviting email contained a broad and short outline of the study and aim of the interview. In case of reply a detailed message was sent including consent form and list of questions for preparation (copies in appendix III). Interviews were conducted between March 16 and April 1, 2020.

Organization of questionnaires

The questionnaire was designed in February and March 2020 using online survey tool Wen Juan Xing. The initial list of questions was translated from English to Chinese by SMU faculty support. Then, questions were fine-tuned, edited and piloted. Pilot participants included two freight forwarders, one staff member of a shipping line, a classmate my supervisor (all Shanghainese) and one of the interviewed professors. They all piloted the Chinese version of the questionnaire. Feedback revealed the survey was considered too long and several questions were deemed not relevant. Textual issues were highlighted as well among other issues. Amendments were processed and the questionnaire was distributed among members of the Shanghai International Freight Forwarders Association (SIFFA) during the end of March. SIFFA is linked to the China

International Freight Forwarders Association (CIFA) and CIFA has ties with the International Federation of Freight Forwarders Associations (FIATA).

Sample of freight forwarders

I hoped to establish a reasonably detailed picture of the population of freight forwarders in Shanghai before distribution of the questionnaire by consulting major Chinese industry representations. Written (email) and verbal (follow up telephone calls) inquiries to SIFFA, World International Freight Forwarders Alliance (WIFFA), JCtrans, WCA China Global and CIFA, only returned a statement from WIFFA that registration of forwarders in their directory is on volunteer basis. A message to the Chinese ministry of commerce concerning the population of freight forwarders in Shanghai was not replied. WIFFA and JCtrans directories hold 13.416 and 19.981 records of freight forwarders in Shanghai respectively. Many of the email addresses in these records contain generic hostnames like hotmail.com, qq.com and 163.com. An online article reports 'more than 10.000 registered forwarders' in Shanghai alone (Fan, 2019). Fortunately the owner of a forwarding business in Jiaxing was so kind to provide background. According to him, a very rough estimate of *registered* forwarding businesses in Shanghai would be *at least* 5.000. SIFFA members are not necessarily more 'professional' then non SIFFA members, according to the same business owner (telephone conversation with known forwarding business owner, March 2020). Although more precise population data would be desirable, unfortunately it is not. Based on the pieces of information scrambled together the SIFFA directory is considered a reasonable base for questionnaire distribution.

Ethics

Interview and questionnaire participant's identity is not released. Completed surveys are never linked to participant's identities whether completed on- or offline. This has been communicated in a consent form (interviews) and in the cover letter (questionnaires).

Interviewees were asked at the start of the interview if they had any objections to record the conversation. Digital files will be removed and disposed from any place or device after assessment of this thesis. A similar procedure will be followed for questionnaire returns.

3.4 Conclusion

Looking back at the overall approach taken in light of experiences conclusions are drawn as follows.

Strengths

The qualitative nature of the study produced rich insights from *true* experts through interviews. Due to unavailability of Chinese experts, course had to be changed. In the end however, the variety of descendents of experts is considered a strength rather than a weakness. The questionnaire represents up to date attitudes from practitioners, moreover it allowed to produce the numbers required for this dissertation. No other tool could have achieved this in an economic way.

Weaknesses

Sampling appeared to be challenging. Still today I am unable to establish a reasonable accurate picture of the population of freight forwarders operating in Shanghai. This could be considered problematic when interpreting the findings. Possibly, building relations with associations started too late and therefore valuable information remained concealed. The questionnaire made me dependent on responses, which can be considered low. If the study were to be repeated I would first finish interview analysis before designing the questionnaire for additional focus.

Finally, the case study approach would have resulted in rich data from practitioner's side as well. That idea sounded attractive. However, taking into account the data collection

process and return rate on the questionnaire the number of businesses actually engaging in blockchain seems to be low. To find these would be challenging, let alone getting access.

Chapter 4. Results

Interview and questionnaire findings will be reported by addressing the research questions one after another. Interview and questionnaire results will be related to each other, as well as to literature from chapter two. Conclusions of this chapter are summarized in chapter five. Before fragmenting the findings, a holistic picture of each interview is offered to convey the interviewee's general line of approach towards blockchain in relation to freight forwarding. Obviously, the interviews contained much more shade then the quotes presented here, these nuances will be used in subsequent sections. First up are the questionnaire response details.

4.1 Questionnaire response

Out of 483 SIFFA members, 395 companies disclosed email addresses (2018/2019 directory). Initial email distribution returned 156 undeliverable messages; all these businesses were checked online and finally 367 companies received a personalized invitation. Addresses of 28 businesses could not be traced. The email message included a cover letter (in Chinese), and a QR code or link taking participants to the questionnaire. Participants were also given the option to complete and return a hardcopy of the questionnaire as email attachment. Where possible, university logos were used for credibility; a university email account was used. Copies of the questionnaires (English and Chinese) are available in appendix IV. Ten days later personal reminders (in Chinese) were sent. The initial two invitations yielded 24 returns. Lastly, phone calls (in English) were made to every recipient, which yielded an additional 17 returns. Two returns were abandoned due to unanswered items, leaving 39 usable responses or a response rate of 11%. Although similar surveys on blockchain among forwarders in Shanghai are, to my knowledge nonexistent these numbers could be qualified as low. The low rate of response is a first clue that blockchain is not a concern among

forwarders in Shanghai. Because perceptions on blockchain of non respondents might differ from those who responded, reliability of the survey might be hampered. Often heard comments during the telephone calls related to respondents unfamiliarity with blockchain technology. One written reply from the 'chief delegate' at the Shanghai office of a service provider operating a global network stated; 'we are not involved in blockchain technology'. These issues should be kept in mind while interpreting the data and drawing conclusions. Although 39 returns are over Cohen's threshold of 30 for using any form of statistical analysis, the number is still small (Cohen et al. 2018, p.203).

4.1.1 Internal reliability and validity

43 variables were measured by using a scale (Likert style). Summated scores were tested by computing Cronbach's alpha reliability coefficient using the equation below.

$$\text{Cronbach}'\text{s alpha} = \frac{n}{n-1}\left(1 - \frac{\text{Variance}_{(\text{error})}}{\text{Variance}_{(\text{observed scores})}}\right) \quad (1)$$

This returned a value of 0.85; meeting the threshold of 0.85 for what could be described as a 'good reliability' (Oppenheim, 1992, p.200) and over the 'minimum' level of 0.70 (Fraenkel and Wallen, 2000, p.179). It is assumed that the scale questions used in the questionnaire produce consistent (reliable) results while still supplying accentuations. Overall questionnaire validity was maximized by conducting pilots and direct links between research questions and questionnaire questions. The use of multiple instruments (questionnaires and interviews) contributed to increase validity, study wide.

4.1.2 Questionnaire demographics

Selected demographic characteristics suggest respondents should be regarded as knowledgeable. For example 77% indicated to have at least 10 years experience in freight forwarding and logistics. In addition, 82% of the respondents are manager,

president, CEO or owner of in the responding company. Classification of company size in transport and logistics in China is provided in figure 4.1. Participants were requested to classify their company correspondingly. Chinese company size classification differs across industries. Next to employee count, division could also be done based on operating income (Chinese statistics bureau, 2017). Here, staff count only did set grouping.

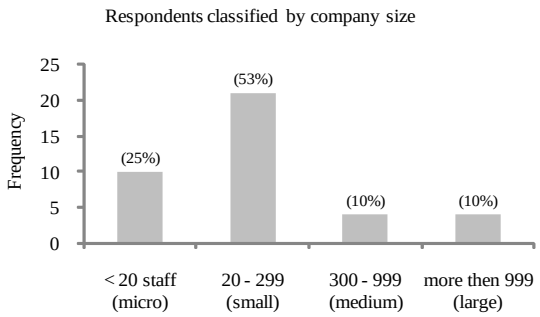

Figure 4.1 Company classification in logistics and questionnaire response

4.2 Holistic pictures of the interviews

Some interviewees pictured broad and conceptual horizons while others adopted a more practical approach. Yet others were in the middle. Below are the introductions of six interviewees. Written feedback from E6 has not been included here.

E1. Doctor specialized in logistics and operations management

The expert explained that 'it all comes down to their value proposition', while discussing future business models of freight forwarders. The expert also noted that 'if you are not digitized you will be out of the game pretty soon', when talking about what forwarders can do in future.

E2. Professor and director of a maritime logistics research center

Expert 2 commented ‘don’t just think about blockchain’ when asked why blockchain could have an impact on freight forwarders. On the same question the expert added ‘I would not say blockchain itself can work’.

E3. Professor in logistics

When talking about changing tasks if blockchain applications are available the expert noted ‘they (forwarders) need to transform a little bit … it just transforms’.

E4. Professor at a supply chain innovation center

The expert qualified the freight forwarding industry as ‘the best industry for blockchain applications in terms of the environment in which they operate’. Asking if blockchain will eliminate the role of forwarders the professor responded ‘I think blockchain will enhance the role of freight forwarders, enhance’.

E5. Professor, maritime policies

This professor reflected as follows; ‘the technology will certainly fundamentally change the future. I think, if companies like Alibaba and Amazon can extend the business to transportation they can link every stage of trade in one package’. Discussing possible disintermediation the expert noted, ‘traditional freight forwarders are dying, it is a dying industry’.

E7. Senior researcher at a shipping research institute

Professional 7 remarked that the main problem in international transport is information sharing. He added, ‘although a relational database could achieve similar things as a private blockchain, my expectation is blockchain could be the catalyst … because we want to achieve information sharing since 20/30 years’.

Paragraphs 4.3 till 4.8 will provide results and discussions per research question.

4.3 RQ1. Explore why experts believe blockchain technology would have an impact on freight forwarders.

Due to its emergent state all experts noted it is too early to sketch precise impact of blockchain technology on forwarders. This is equal to what was found in papers by Hackius and Petersen, 2017; Queiroz and Wamba, 2019; Yang, 2019; among others. One expert believes blockchain will 'enhance' (E4) the role of freight forwarders, another thinks traditional freight forwarders will 'die' (E5) when blockchain applications are available on wide scale. The experts agree that forwarders' ties with other actors are the root why blockchain will impact them. This is similar to Murphy and Daley (1996) and their assessment of EDI and consequences for forwarders. Communication with stakeholders was considered the lifeblood of a forwarder and a reason why EDI would impact them.

4.3.1 Conceptual approach

Experts two and five in general adopted a more conceptual approach towards blockchain, interview wide compared to the other experts. According to E2 blockchains could transform standalone parties in a secure, integrated network. Blockchain should not be regarded as standalone technology though, E2 noted. Blockchain together with AI, IoT and other technologies can achieve and 'improve the economies of flow, economies of connection and economies of future technologies' (E2). E5 also sees freight forwarders as coordinators. For this reason blockchain could have an impact on them. Especially if conglomerates like Alibaba and Amazon extend their business to transportation. E5 reasoned. Such companies can then offer the whole spectrum of services 'in-house'. Banks, carriers, insurance companies and freight forwarders will all have less impact as individual industries if this type of company would decide to build a blockchain and

move into transportation. If they do, there will be less to coordinate for forwarders. Table 4.1 reflects a summary of condensed comments from each interviewee.

4.3.2 Practical approach

E1 thinks blockchain will disrupt freight forwarders. However it is not expected blockchain 'will radically shift the whole industry', because shipping is 'old fashioned' (E1). The expert witnessed that freight forwarders were 'quite afraid' when blockchain appeared, because they thought of themselves as vulnerable middlemen.

Blockchain applications will enable efficient international trade. Transfer of cross border trade documents will become much easier, E3 noted. The expert made a comparison with Europe before free circulation of cargo existed. Forwarders had the privilege to prepare all kinds of paperwork but this work disappeared as soon borders became seamless crossings. The expert expects the technology will be everywhere and it will impact and benefit both large and small forwarding businesses. Similar to E1, logistics is considered 'a conservative branch after all'; therefore the impact on forwarders will be step by step.

Table 4.1

Why experts think blockchain will impact freight forwarders

Expert	Motivation
E1	Forwarders connect parties, forwarders aggregate demand and supply, they are the miiddlemen
E2	Blockchain can efficiently connect stakeholders in international transport
E3	Transformation of isolated proprietary IT systems into integrated systems will contribute to efficient international trade
E4	Blockchain can connect stakeholders, forwarders can enhance their role because they are in the middle
E5	Forwarding are coordinators of other parties, if big players will develop a blockhain there will be less to coordinate for forwarders
E6	Uniform systems will transform forwarders into blockchain-data driven businesses
E7	Blockchain will impact the supervision function of forwarders because data can be extracted directly from a chain

From the moment an international trade transaction is concluded a stream of documents is being produced (E4). Applying for such documents are isolated processes now, often coordinated by freight forwarders. However, ‘documentation today can easily be done in a blockchain’ (E4). Due to freight forwarders hold a position in the center dealing with multiple parties, they maintain the most information among all the stakeholders involved in supply chains. Due to blockchain this position could be strengthened.

The primary impact on freight forwarders of blockchain will be on their supervision function E7 reflected. Information could be extracted directly from a blockchain. Although a private blockchain can do similar things as a shared database, blockchain could be the ‘catalyst’ (E7) to achieve this (data sharing). Where other experts highlighted cross border trade documents as primary candidates for digitization on a chain, E7 is cautious, the expert commented; ‘when you would like to have a certain document you will ask a freight forwarder … this cannot be done in a blockchain’. This comment should be regarded as a reflection of current practices rather than denial of blockchain’s potential. The expert noted that electronic bills of lading are here for years but it is lacking wide adoption. Due to legislative differences, let alone wide adoption through blockchain based smart contracts.

4.3.3 Who goes in the middle?

The design of blockchain technology is the root why experts share the idea that blockchain will have an impact on forwarders. This is in line with Drescher, 2017, p.21; Casey and Vigna, 2018, p.58*; Tapscott and Tapscott, 2018, p.18*; Swan, 2015, p.10; among many other authors who explain blockchain has the ability to transfer tangible and non tangible items between peers in an encrypted manner. What does this have to do with impact on freight forwarders? The traditional value proposition of freight forwarders is their ability to ‘assimilate and manage various types of information’

Murphy and Daley (2000). Freight forwarders orchestrate stakeholders and by doing so they occupy a position in the center (Schramm, 2012, p.24, Blum, 2019, FIATA, 2020).

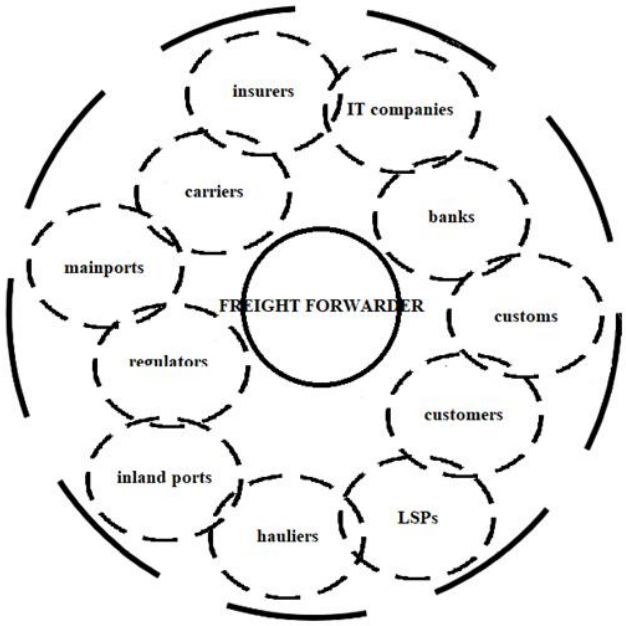

Figure 4.2 Freight forwarders in the center among integrating stakeholders

The center position of forwarders among stakeholders is visualized in figure 4.2. Forwarders are assemblers of bits of information passed on by, or gathered from stakeholders. A blockchain however is the assembly line itself. It connects pieces of information and forms a chain of coherent transactions. Consequently blockchain allows further integration among actors in the maritime supply chain and the circles in figure 4.2 (company boundaries) become less obvious. Previously containerization and formation of trade blocks (Davies, 1981; Schramm, 2013, p.74) drove integration, today it is information technology. The logic of E2 and E5 seem to follow that the more actors integrate, the less space is available between them for assimilators. As a result such players are 'pushed' out of the circle and 'die'. In literature this pole is formed by Shi and Wang (2019), who reason forwarders will be redundant. On the other hand, if

forwarders are capable of finding new ways connecting businesses (for example through the use of blockchain technology) they could still claim their place inside the circle as explained by E1 and E4. This pole in literature is represented by Loklindt et al. (2019) who predict 'vast gains' for forwarders because of their center position. Scenarios might be different, however the starting point seems to be equal; the center position of forwarders.

The figure also illustrates individual industries might play a smaller role if Alibaba and Amazon type of companies extend their business in maritime transport as suggested by E5. If they do, such company boundary stretches till the outer circle. Blockchain infrastructures could form the tool to manage and connect activities. Essentially, any player in the circle capable of mastering roles of other actors (carriers or LSPs) could do so. In this sense blockchain would enable colossuses to emerge. A hybrid form of blockchain between public and private might then surface and outsiders could gain (paid) access to vast networks (also see paragraph 4.8.1).

In an environment characterized by blockchain driven integration, forwarders' center position becomes less obvious. Instead of wondering who goes in the middle, a better question would be to ask what forwarders could do to continue to play a connective role; among maritime actors in the circle, or to connect maritime circles with other circles.

4.4 RQ2. Forwarders redundant in an industry surrounded by blockchain applications?

4.4.1 Interview results

The reply to RQ2 follows a similar dividing line among the interviewees as in RQ1. While E2 and E5, responded in the line of 'yes, but', the experts adopting a less conceptual approach responded in the line of 'no, but'. E5 was most explicit by stating

‘traditional businesses will move out of the market’. E2 commented similarly on SMEs in combination with future technologies, ‘think about it, think of the costs of the systems and the resources of SMEs’ (E2).

Broadly speaking the other experts explained forwarders need to think about their value proposition they can offer. E1 noted; ‘forwarders need to embrace and evolve, as long as they add value there is no point that they will be phased out’. E3 added that outsourcing will continue but that the work forwarders perform will transform. Although E4 stated blockchain can enhance forwarders, the expert noted they should not remain static. Forwarders should familiarize themselves with the technology and think of ‘new value propositions’ (E4). Lastly, E7 noted cargo itself cannot be moved on a chain, these activities will largely remain untouched. Table 4.2 provides condensed interviewee responses to potential disintermediation of freight forwarders in an industry surrounded by blockchain technologies.

Table 4.2
Should freight forwarders be regarded as redundant when blockchain applications are available - expert views

Expert	Motivation
E1	No but, freight forwarders should evolve and embrace. ‘Here it is, what we can get out of it?’
E2	Yes, blockchain will eliminate forwarders on the very lowest level
E3	No but, the services they offer will change and they need to transform
E4	No, ‘blockchain will enhance the role of freight forwarders’ but they need to think of a new value proposition
E5	Yes but, ‘the function itself will continue to exist’
E6	No but, data will become the new merchandise of forwarders
E7	No but, forwarders should be capable of offering alternative services

4.4.2 Questionnaire results

RQ2 was directly posted in the survey. Respondents were asked to assign a level of agreement whether blockchain would eliminate their role. While almost two thirds of

participants remained indecisive, mixed results are observed left and right from neutral. Table 4.3a reflects frequencies and percentages. Only 15% (strongly disagree and disagree combined) mutter on the statement blockchains will eliminate their very own industry. Company size in staff members is a differentiator; seven out of eight who agree blockchain will eliminate their business come from micro and small businesses. No single participant disagreeing is from a micro firm. The issue of unfamiliarity with blockchain highlighted in paragraph 4.1 might be the reason for 64% neutrality.

4.4.3 Company size and assumed redundancy

E2 and E5 agree there is limited future for the lowest layer of forwarders. Other experts think that small should not necessarily be a problem or a bigger problem than operating a large business. Large companies are less agile then smaller colleagues and the technology will be everywhere (E3). E1 has seen technology driven startups doing very well. 'It depends on the environment in which they operate'.

Table 4.3a

Levels of agreement among forwarders that blockchain will eliminate their role

Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Totals
2	4	25	8	0	39
(5%)	(10%)	(64%)	(21%)	(0%)	(100%)

Table 4.3b

Comparison micro and larger businesses

Variable	Micro business	Larger businesses	T-value	Hedges'-G
Blockchain will eliminate the role of forwarders	3.4[a]	2.9	2.51[b]	-0.76[c]
Blockchain is an opportunity for my business	3.4	3.6	-0.75	0.30
Blockchain is a threat for my business	3.1	2.8	1.08	-0.36

[a] 1= strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

[b] statistically significant at the 0.05 level and one tail

[c] magnitude of effect 'rule of thumb'; 0.20 = small, 0.50 = medium, 0.80 large (Cohen et al 2018, pp 746)

Setting apart micro business respondents (<20 staff) from any larger business reveals statistic significance between the groups when comparing mean scores of attitudes towards elimination, as can be derived from table 4.3b. The magnitude of difference measured by Hedges' (g) test (because of small and unequal sub-samples) returns a value of just over three fourths of one standard deviation; a medium effect size (Cohen et al. 2018, p.746). In other words, the difference between mean scores of micro and any larger business when asked to assign a level of agreement whether blockchain will eliminate the role of forwarders is medium. As benchmarks are not available, medium (or 0.76 SD) is proposed as yardstick here. One should remember limited power due to small samples. Overall, the mean is exactly 3, with smaller business on the right from neutral and larger businesses on the left (table 4.3a). The distribution measured, support statements by E2 and E5 related to SMEs and their vulnerability. These views are similar to Poulis et al. (2011) who commented on ICT innovation in shipping. They noted that SMEs see the advantage but have difficulties to keep up. Earlier, Markides and Holweg (2000) noted that sophisticated technologies were putting pressure on SMEs. Already in 1996, Murphy and Daley measured a difference between SMEs and larger companies on the likelihood of using modern technologies among forwarders.

Even so, if the technology will be 'all over' as estimated by E3 then blockchain could be a similar opportunity as internet was for SMEs (Bollo and Stumm, 1998). Previously Stopford (2002) commented on intermediaries and e-commerce in a similar direction. He reasoned especially small businesses would gain from the 'cyber-boom' because IT was simplified through internet; thus posing a lower entry barrier for businesses in this category. Since e-commerce triggered fragmentation 'down the supply chain', Anderson and Anderson (2002) commented it is wrong to conclude middlemen (large or small) will be eliminated when new IOS's emerge. Intermediaries can use their position in the middle to glue fragments and thus solve suppliers and buyers problem. Moreover and despite previous IOS's, Liang et al. (2019) noted that the number of international freight

forwarders operating in the Yangtze River Delta 'skyrocketed'. They counted 327 forwarding businesses in 2005, a fraction compared to the most conservative estimate of businesses operating in Shanghai alone today Even E2 and E5 (both residing in China) acknowledged the vast population of (low level) forwarders. It indeed indicates that emerging IOS's are not equal to disintermediation of freight forwarders per se. Based on the evidence it cannot be stated blockchain will be different. Whatever the size of the business, experts recommend to go out, explore and evolve. As long as they do there is no reason to assume disintermediation.

Micro and larger companies also hold different perceptions when assessing blockchain as opportunity or threat. Yet, no statistical significance at the 0.05 level exists

4.4.4 Blockchain advocates

But what about these warnings a calamity is on its way? It became clear from previous research question that the forwarders' position in the field connecting stakeholders is the root for disintermediation-discussions. What Drescher (2017, p.22) considers a threat is an opportunity for others, depending on the perspective one takes. The same author qualifies disintermediation as an 'accomplishment' (Drescher, 2017, p.242). The use of that word reflects his software-background and corresponding enthusiasm for blockchain when analyzing technical capability of blockchain in its purest form. The enthusiasm of Shi and Wang (2018) of an overall 'farewell' of intermediaries in shipping might also arise from the pure technical features. Based on the findings, a 'farewell' scenario for forwarders does not seem likely on the short run for reasons outlined above.

Statements that blockchain will trigger dispensation of intermediaries seem to come from work adopting a pure technical or highly conceptual angle while excluding particulars or reality checks. Still, it became clear, forwarders who stay static might run

into scenarios pictured by Shi and Wang, 2018; Szewczyk, 2019; Jugović, 2019; among others, who estimate blockchain will phase out intermediaries.

4.5 RQ3. Do freight forwarders consider blockchain technologies

Respondents were queried whether their company participates in a blockchain project. 82% reported not to do so, nor having plans to do so. Three and four businesses reported they currently do, or having a plan to do so within the next year respectively, as can be derived from table 4.4a.

Perhaps obvious these seven businesses score a lower average mean then the other 32 companies when asked; 'I am uncertain what blockchain can do for my businesses' (table 4.4a). A statistical significant difference is measured between organizations which are currently participating or having a plan to participate in a chain and their counterparts not having plans. Details are available in table 4.4b

4.5.1 Familiarity with blockchain

Table 4.4a also shows that close to 77% expressed to be uncertain what the technology can do for them. The issue seems to be confirmed by respondents when asked to rate prescribed barriers for implementation. Ten barriers were drawn from literature and respondents were requested to classify every barrier from 'very important' to 'very unimportant' on a five-point scale. 'Limited knowledge about blockchain technology' appears on top of the list as most important barrier (table 4.4c). The issue of chain governance highlighted as 'hot topic' by E2 and 'key challenge' by Lacity (2018) is ranked 8 (out of 10) by respondents. In addition, lacking knowledge on blockchain technology could be one explanation for 'neutral' being returned most frequently on scale questions, survey wide. From the scale questions (all five-point) 43% of the answers were given on the mid-point neutral. It is acknowledged that, opting for the

middle can be considered a common characteristic in East Asian cultures (Cohen et al. 2018, p.484).

Table 4.4a

Does your company participate in a blockchain development project?

Yes, we currently do	We plan to do within one yers	We do not have a plan to do so	Total
3	4	32	39
(8%)	(10%)	(82%)	(100%)

I am uncertain what blockchain can do for my company

Strongly disagree + Disagree	Neutral	Agree + Strongly agree	Total
9	18	12	39
(23%)	(46%)	(31%)	(100%)

How important is blockchain to be a profitable freight forwarder?

Very Important + Important	Neutral	Unimportant + Very Unimportant	Total
13	26	0	39
(33%)	(67%)	(0%)	(100%)

I expect blockchain will have an impact on our organization

Strongly disagree + Disagree	Neutral	Agree + Strongly agree	Total
1	24	14	39
(3%)	(62%)	(36%)	(100%)

Table 4.4b

Comparison of businesses participating in a BC project or planning to do so and businesses without a blockchain participation plans

Variable	Plam	No plan	T-value
I am uncertain what blockchain can do for my company	2.14[a]	3.25	-3.73[b]
I expect BC will have an impact on our organization	3.43[a]	3.44	-0.02
How important is BC to be a profitable freight forwarder?	2.43[c]	2.59	-0.51

[a] 1= strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

[b] statistically significant at the 0.05 level and one tail

[c] 1= very important, 2 = important, 3 = neutral, 4 = unimportant, 5 = very unimportant

Table 4.4c

Top three barriers and benefits of blockchain technology by forwarders

Benefits		Barriers	
Reduces fraud	1.85[a]	Limited knowledge abt BC technolog	2.07
Tracking & Tracing	1.97	Fragmented legal requirments	2.15
Quick access to information	2.10	Technological readiness	2.18

[a] 1= very important, 2 = important, 3 = neutral, 4 = unimportant, 5 = very unimportant

4.5.2 Blockchain perceptions and company characteristics

Relations between two demographic features (company size and age) and seven dependent variables measuring company attitudes towards blockchain were examined using Spearman's rank correlation test.

Table 4.5
Spearman rho's for selected variables

	Company size	Company Age
I expect blockchain will have impact on our organization	-0.11	0.10
I am uncertain what blockchain can do for our company	0.26	-0.34
Blockchain will change our business model	-0.11	0.18
Blockchain is an opportunity for our business	-0.19	0.11
Blockchain is a threat for our business	0.29	-0.07
How important is blockchain to be a profitable forwarder	0.20	-0.06
Blockchain will eliminate the role of forwarders	0.26	-0.14

Numerical values of the correlation coefficient are all low (table 4.5), indicating a weak strength among variables. Company age in specific seems of minimum influence to any item measuring respondent attitudes. Figure 4.3 shows that only 0.12 ($0.12 = (-0.34)^2$) of variation shown by the variable measuring uncertainty what blockchain can do, can be attributed to business age. All other tested variables have less in common.

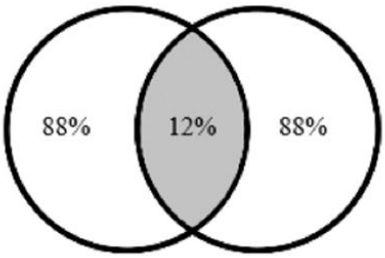

Figure 4.3 Visualization of correlation of 0.34 between company age and the level of certainty what blockchain can do

4.5.3 Assumed importance of blockchain

While it could be concluded know-how on blockchain among practitioners is limited, the observations suggest that forwarders find blockchain an important theme. Not one respondent regard blockchain as unimportant to earn a profit in future (table 4.4a). Approximately one third of respondents expect blockchain will impact their business. This belief is shared among active explorers of blockchain and colleagues who do not, nor having a plan to participate in near future.

4.5.4 Why not?

So do practitioners consider blockchain technology? Essentially and accentuations excluded, all of the above is a long stretched no. Respondents are unaware what blockchain can do for their business and limited knowledge qualified as most important barrier. Why is this? Wagner (2008) studied innovation in transportation. He calculated that expenditure on innovation (training, acquisition of knowledge, R&D, among others) in certain sectors of manufacturing is over 7.5 times greater than in transportation. From expenses in transportation the center of gravity is on investment in DCs, logistics parks and procurement of new fleet and less on information technology. Although the study focused on German logistics it's a first clue. Zooming in on China, Chu et al. (2018) in their analysis found that LSPs in China 'neglect any innovation potential outside customer requirements'. Innovations are mainly in the sphere of geographic coverage, new areas served rather than new information technologies adopted. Earlier Cui et al. (2012) identified efficiency, enhancement of service portfolios and customer requirements as key drivers for innovation in Chinese logistics. If this logic holds true today a possible explanation for non involvement and limited knowledge by practitioners in blockchain would be that customers are not inquiring for it. The argument from paragraph 4.3 that the technology is in its emergent state is added to explain practitioners (and shippers?) do not engage in blockchain on wide scale yet.

Service providers and IT

Qualification of limited knowledge as prime barrier is in line with findings of a survey on IT adoption in logistics in Hong Kong by Lai et al. (2005). Respondents ranked lack of expertise of IT in general and inadequate knowledge of implementation, as first and second barrier respectively. Earlier, in 1996 however, Murphy and Daley surveyed US forwarders on EDI. Respondents ranked lack of awareness of benefits as fifth most important barrier, considerably lower than Lai et al. and present study. However 1996 was more than 30 years after the first commercial EDI message was sent and 10 years after the introduction of a global message standard (McCarthy, 2013). The Murphy and Daley survey was conducted while EDI was in a different stage of development compared with blockchain today.

Technical issues

E1 and E4 referred to successful blockchain proofs of concept. Carlan et al. (2020) reported no technological issues either when analyzing three blockchain applications in the maritime sector. Respondents in Shanghai however refer to technological issues (third most important barrier) and IT companies (identified as most important stakeholder for own involvement). This indicates a gap between technical capabilities and awareness of such capabilities on the ground; consistent with the knowledge issue classified as most important barrier.

4.6 RQ4. Changing tasks of freight forwarders when blockchains are out

Talking about forwarders and changing tasks did not fit the line of approach of E5. To certain extend 'blockchain itself will be the forwarder, it will remove the need of freight forwarders because information is shared from the source' (E5).

Practitioners were requested to indicate their level of agreement to perform selected tasks on a blockchain. Table 4.6b reflects ranking of activities and their potential to be

performed on a chain. Despite the moderate range (0.28 Likert scale point) and 51% of the replies given on the midpoint, some accentuations are worth mentioning.

4.6.1 Transfer of documentation; theory and practice

Whereas experts and papers cited earlier regard transfer of documents as prime candidate (table 4.6a) it is ranked fifth among forwarders. Lifting out some papers shows that Norberg (2019) used numbers of a Maersk pilot to explain what blockchain *could* do to 'dramatically reduce paperwork'. Shi and Wang (2018) also cited the Maersk pilot and commented blockchain *can* replace 'cumbersome' handling of docs today. Lehmacher and McWaters noticed that a 'pile of paper 25 cm high' is required to ship one container, the same Maersk container. This container is used by various other authors to tell what blockchain can do. The numbers born from the Maersk pilot (30 organizations, 200 communications and 25 cm paperwork) are significant. However the consignment covered a reefer unit with flowers traveling from Africa to Europe. A dry container containing a less sensitive commodity (and involvement of less authorities) travelling between developed countries will likely generate smaller numbers. Works lifted out here did not conduct checks with practitioners.

The different approach related to paperwork between experts and forwarders found in this study is similar to what Hackius and Petersen (2017) found in their survey among stakeholders in Europe. LSPs were more skeptical with regards to processing paperwork on a blockchain than consultants and scientists. Possibly, practitioners are tempered by reality of daily practice or experiences from previous emerging tools, forecasting similar things (EDI, Internet, among others).

4.6.2 Cargo booking

Blockchains peer to peer character is not expected to trigger a desire at carrier side to exclude forwarders from the booking process on the short run. Carriers and forwarders

are dependent on each other, E2 explained. Especially when forwarders act as NVOCC. E1 agrees and remembered an unsuccessful initiative by shipping lines early 2000s (GTN ocean portal). Although successful blockchain proofs of concept were conducted it may take a while before such a (decentralized), blockchain based, booking platform will take off. Technology is immature and questions related to economic viability and governance need to be answered. E1 reflected ‘a lot of organizations will still need freight forwarding to aggregate demand and supply’. The idea that forwarders and carriers are closely related to each other seems to be shared among practitioners. From participants acting as NVOCC, 79% agreed on the statement that ‘carriers perceive forwarders as means for selling capacity’.

4.6.3 Banking and insurance

Experts 2, 3, 4 and 7 qualified the banking function of forwarders to change. For example if sales transactions are being concluded based on crypto currencies, E3 and E7 added. Customers possibly expect forwarders to offer facilities to handle such digital currencies, was one of the comments. Banking on a chain is considered less obvious among forwarders, it is ranked last. One explanation for this might be the obstruction on trading crypto currencies in China. Potentially, less exposure causes banking to be a less apparent option. A comparison with private and public chains in general is pushed forward. Casey and Vigna (2018, p.160-161*) think open access (public chains) ‘foster passion and enthusiasm’ while gate-keeping (private chains) leave open ‘the possibility of restriction on outsiders‘. On the other hand however, digital payments are fully integrated in Chinese society. This could be the reason blockchain payments are considered less of an issue too.

Table 4.6a

The changing functions of freight forwarders when blockchains work – expert views

Function	Identified by Expert
Documentary function	E1, E2, E3, E4, E5, E6, E7
Insurance function	E2, E3, E4, E7
Booking function	E1, E2, E4, E7
Banking function	E2, E3, E4, E7
Customs function	E1, E2, E3, E4

Table 4.6b

Ranking of predefined activities to be performed on a blockchain – forwarder views

Activity	Average score
Obtain insurance	3.64[a]
Send and receive bookings	3.56
Arrange custom clearance	3.51
Send and receive quotations	3.48
Transfer original documents	3.48
Perform functions B/L	3.46
Make and receive payments	3.35

[a] 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

Obtaining cargo insurance heads the forwarders list as most likely task to be performed on a chain. This interface's with the reduction of fraud highlighted by forwarders as primary benefit of blockchain technology. Marine insurance was acknowledged by experts 3, 4 and 7 as well, but most distinctly by E2. Marine insurers are eager to explore blockchain based solutions because 'there are a lot of fraud cases in China with bills of lading and letters of credit'. Insurers are expected to be drivers of blockchain based contracts to reduce fraud (E2). This possibly explains an initiative by Zhuhai port holdings and a private company to explore blockchain based marine insurance applications (Olano, 2019).

4.7 RQ5. Potential new business models when blockchains are around

4.7.1 Interview results

Experts commented that business models for forwarders in blockchain settings are not on-the-shelve packages. It depends on the environment in which forwarders operate the type of customer served and resources available. E1 and E4 emphasized the development of (new) value propositions. 'Who are the key customers, what are their pain points, if forwarders can still address these pain points … then they do add value' (E1). Forwarders should sense what is 'out there' and how their business is going to benefit (E1). E1 added, 'forwarders need to improve their digital capability that is for sure, the future is going to be like that'.

Forwarders could indulge in smart contracts and become specialists in maritime smart contract drafting or building, E4 noted. It might become easier for forwarders to add new services or extend the current range of options. For example, a wider range of insurances and letters of credit could be offered (E4).

Experts 1, 3 and 4 mentioned that management of bookings and other activities forwarders perform on behalf of their customers could be enhanced by blockchain. A service center type of organization (4PL) was mentioned by E3. Forwarders already engage in such activities but the driving will be different in a blockchain environment. Focus on consultancy/matchmaking was also noted by E3 and E7. E7 suggests forwarders to charge a premium when requested to retrieve certain data from a chain.

4.7.2 Questionnaire results

Participants did not use the opportunity to share examples of services they could offer in a blockchain surrounded environment. Regardless the reason, 36% agree their business

model will change when blockchains are around. While common demographic features queried in this survey are absent, these 14 distinguishes themselves by considering blockchain an opportunity in a larger extend then the other 25 repliers. Details are available in table 4.7.

Table 4.7
Level of agreement among forwarders that blockchain will change their business model

Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Totals
0	2	23	9	5	39
(0%)	(5%)	(59%)	(23%)	(13%)	(100%)

	Neutral and disagreeing respondents that BC is an opportunity	Respondents agreeing that BC is an opportu	T-value
BC will change my business model	3.16[a]	4.29	-7.17[b]

[a] 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree

[b] statistically significant at the 0.05 level and one tail

4.7.3 Mining customers' problems

In essence forwarders business models are founded on customer issues to be addressed. Without discussing blockchain in specific, Schramm (2012, p.62) already noted that application of IT tools is crucial for forwarders to continue to add value. Earlier, Murphy and Daley (1996) concluded that failure to adopt IT jeopardizes forwarders existence. When the internet emerged it was emphasized by the same authors (Murphy and Daley, 2000) forwarders should explore meaningful value propositions involving the web to remain relevant. But why is it important for businesses to go out, explore, etc?

Go out where, explore what?

In paragraph 4.5.4 it was noted that one of the key drivers of innovation among LSPs is their response to customer needs. This does not seem to be the best approach in achieving long term success. Bower and Christensen (1995) commented that a focus on retaining customers is a 'consistent' reason for businesses to fail when technologies

change. Customers prefer to use applications they know and (are prepared to?) understand. So, do shippers want to understand what is going on inside a forwarders office? As mentioned earlier, Westfall (1987, p.59) noted that shippers 'shy away' from complicated international shipments and Delaney (2016, p.344) advised the use of forwarders to 'save effort and anxiety'. E5 commented during the interview 'you (customer) do not think about a forwarder when you buy, you do not want to know'. Consequently, will a customer demand forwarders to start using 'blockchain', and if so for what, where and how? Disruptive technologies like blockchain (E1; Helo and Hao, 2019; Queiroz and Wamba, 2019; among others) tend to be valued only in new applications Bower and Christensen (1995) explain. Thus, to remain relevant forwarders (or LSPs) should go out, discover and explore applications customers themselves are not aware of and for which a market does not exist. As a start potential areas of application were proposed by experts above. After their analysis of blockchain applications in logistics Tönnissen and Teuteberg (2019) suggested a whole new type of intermediaries might emerge. 'Blockchain service providers' might assist organizations to connect with each other. In a way this is similar to the suggestion of E7 who commented forwarders could charge customers a premium when requested to retrieve data from a chain.

This *could* be the new breed of problem solvers in the blockchain era and the glue between actors (and private chains) from figure 4.2. Anderson and Anderson (2002) used this term when evaluating intermediaries in e-commerce. They concluded a new category of intermediaries appeared when internet and e-commerce emerged. Probably, respondents who consider blockchain as an opportunity rather than a threat are in a better starting point to follow the suggestions by E1, E4, Anderson and Anderson and others to go out and find the applications customers and practitioners did not know existed.

4.8 RQ6. Approaches to prepare businesses for blockchain technology

4.8.1 Interview results

All experts except for E6 used words like fragmented, experimental, pilots and potential to express blockchain is in early stages of development and a perfect approach does not exist. Table 4.8 summarizes approaches forwarders could adopt. Some experts naturally mentioned an overarching body which would accelerate wider adoption.

Table 4.8
How to prepare for blockchain – expert views

Expert	Individual approach	Accelerate / widen adoption if
E1	Explore and embrace Define state of desire and develop strategy to get there	A government will manage something in a blockchain
E2	Depending on company size Include other future technologies	Single window / port community system
E3	Companies need to change strategy	Key role for the port
E4	Businesses should explore	Cooperative blockchain through association
E5		Global platform by Alibaba & Amazon
E6		Industry wide standards initiated by forwarders
E7	Learn about blockchain	Single window / port community system

The suggestions by E1 are in line with Van Hoek (2019) who reported about blockchain case studies in the logistics service sector. Even if projects do not develop as planned the lessons learned represent a return he reasoned.

SMEs should exploit their agility and follow customers and competitors; they are not in the position to lead (E1, E3, E7). Expert 4 noted SMEs scale seems too small to bear costs associated with implementation themselves. The expert proposed a cooperation to be established initiated by forwarders or association of commerce. E7 is not sure with

path SMEs should follow to implement blockchain and new technologies in general; ‘this question we have for several years already’. They could learn about blockchain for example by familiarizing with commercial platforms.

Acceleration of adoption could happen when a government decides to manage something in a blockchain E1 noted. E2 observes that; ‘China is very aggressive in producing a single window system in the seaport’. Such a single window could function as gate through which information is made available in a chain. The relevant stakeholder could then use that piece of information required by him (E2). Similarly E3 sees a key role for ports as well; possibly through port community systems (PCS’s). All the things happening in a port impact the whole supply chain. That mechanism should be used to promote wider adoption (E3). E7 also noted a PCS or single window can play a role in the wider adoption of blockchain. The use of PCS’s to promote integration of IT systems in maritime supply chains was suggested earlier by Marchet et al. (2009) and Carlan et al. (2020).

E5 thinks global and prefers a private organization to assist building a ‘blockchain highway’. It cannot be expected the government will build such a highway and users, using it for free. Carriers holding tentacles across geographies could do so, but they lack incentives, ‘they are very happy now’. Again E5 points to Alibaba and Amazon like enterprises. They have the resources and potential motivation to construct a highway. If such companies deem blockchains as source of profit, they will build it. Possibly, these companies will build it and invite outsiders to use the platform for a fee (E5). In such a scenario even the huge population of small forwarders in Shanghai could obtain (paid) access to a blockchain highway.

Cultural swing

Overall it is about the change of people's behavior. Major challenges towards implementation relate to management and users (E1). This cultural swing corresponds with Poulis et al. (2011) when studying IT in shipping. They highlighted the changes an organization can undergo are dependent on the perceptions of people participating in the project or process.

Legal systems

Regulatory issues needs to be addressed as well to enable wide scale adoption of blockchain systems. All experts except for E6 qualified this as barrier which is contrary to Carlan et al. (2020) who researched blockchain applications in the maritime field. They reported 'on the legal and political fields there are no constraints that arise from the consistency of the legal framework'. This conclusion is based on the evaluation of three non-commercial pilots from which one domestically. Differing jurisdictions across geographies however are generally seen as restraining factor in the maritime field (Mukherjee, 2019) and thus will also affect shipping related processes employed on blockchains. Practitioners in Shanghai rank it second most important after the issue of knowledge.

4.8.2 Questionnaire results

Based on Power and Gruner's (2017) definitions of deliberate and emergent decision makers in relation to adoption of IOS's, respondents were requested to self classify them in one of these categories. As can be observed from table 4.9, 59% of the respondents declared to be a deliberate decision maker. This is atypical when considering that 43% of the answers on scale questions were given on the midpoint neutral, and lack of knowledge qualified as most important barrier.

Table 4.9

Adoption approach of your organization in relation to inter organizational systems

berate decision ma	Emergent decision maker	Others	Totals
23	9	7	39
(59%)	(23%)	(18%)	(100%)

Participating in bl	Yes, we do	We plan within one year	No plan
Deliberate decisio	3	3	17
Emergent decisio			9
Others		1	6

	Micro	Small	Medium	Large
Deliberate decisio	6	10	3	4
Emergent decisio	4	4	1	
Others		7		

Other stakeholders

Respondents were asked to evaluate the importance of selected stakeholders for their own involvement in blockchain. Stakeholders were derived from Bavassano et al. (2020) and selected by myself. European respondents surveyed by Bavassano et al. qualified IT companies as most relevant for implementation of blockchain technologies. Regulators were seen as obstacles as more rules would slow technology development. Forwarders in Shanghai also place most importance on IT companies. Yet, customs and government and regulators are ranked as second and third most important stakeholder (table 4.10). The classification in Shanghai suggests that participants direct more attention to government bodies then respondents surveyed in the Bavassano study. Practitioners were also queried how blockchain knowledge is sourced. ‘Discussion with IT suppliers’ was ranked eight out of ten. This signals that forwarders put most importance on IT companies but discussions with them are limited. This adds to the evidence blockchain is not a hot topic among respondents.

Table 4.10
How important are other stakeholders for your involvement in blockchain technology?

Stakeholder	Average score
IT Companies	2.15[a]
Customs	2.18
Carriers	2.23
Government and regulators	2.23
Cargo owners	2.26
Port authorithy	2.31
Terminal operators	2.33
Competitors	2.51

[a] 1 = very important, 2 = important, 3 = neutral, 4 = unimportant, 5 = very unimportant

4.8.3 Who carries the enterprise?

While experts pursue practitioners to take initiative, forwarders seem to be hesitant, keeping an eye on authorities before making blockchain related moves. Possibly this can be assigned to the different backgrounds of interviewees and practitioners. The experts most outspoken in their recommendation to go out and explore (E1 and E4) are not from China. Their view is similar to authors who argue for entrepreneurship (Casey and Vigna; Tapscott and Tapscott; Nordberg, 2019). And the approach is in line with respondents in the Bavassano study who consider regulators as a constraint. The importance placed on regulators by respondents in Shanghai could be explained in two ways.

First, blockchain might be connected with illegitimate activities; the ban on ICOs and (digital) currency exchanges. Parker (2018) goes so far to label bitcoin a ‘taboo’ in China. Moreover the decentralized nature of blockchain is in contrast with the desire to regulate (cross border) data networks top down (Harwit and Clark, 2001). The internet

as well as blockchain enjoy attention of the highest levels of Chinese policy makers (Creemers, 2015; Foxley, 2019; Parker, 2018), thus creating a gray area in which practitioners seem to call for guidance.

Secondly it might reflect the relatively young age of the forwarding and logistics market in China compared to markets in other geographies. As highlighted in chapter two, steps to introduce competition were taken in 1985 and barriers were only removed in 2005 (Lu and Dinwoodie, 2002; Liang et al. 2019). The stage of development of the forwarding industry might thus also be the reason for businesses turning to governing bodies for assistance.

This also provides a possible explanation of the atypical responses of practitioners (compared to the other answers) when asked to classify themselves as deliberate or emergent decision maker. Perhaps respondents consider themselves as deliberate, but environmental factors do not permit to be.

Chapter 5. Conclusions

The last chapter will first outline the most important conclusions from chapter four, followed by limitations and future research suggestions.

5.1 Industry integration

Due to its design, blockchain technology does allow a next phase of integration among maritime stakeholders. Forwarders in their role as assemblers of bricks of information will be affected because a blockchain is the workshop itself. Bits of informations can be transacted and ordered in a validated sequence (blocks) which does not require assimilation or recycling by forwarders. The center position of forwarders is used by some to explain blockchain will trigger a process of disintermediation. Predominantly such position is taken by technical and conceptual focused thinkers. Others, who examine instances in depth, tend to conclude blockchain will be a chance to strengthen the center position of forwarders and intermediaries in general.

This study explored the potential effect of blockchain on freight forwarders through the lenses of maritime experts and practitioners. It concludes that dispensation or disintermediation of forwarders will not be likely, at least not on the short run. E1 noted that ‘a lot of organizations will still need forwarders to aggregate demand and supply’. If the technology will be ‘all over’ (E3), barriers to access the technology will be low. Accordingly, the massive population of small forwarding businesses in Shanghai could be one of the beneficiaries in particular. Even one of the most conceptual orientated experts (E5) anticipates that ‘blockchain highways’ might emerge. Whether or not developed by a private entity it will need drivers using them, possibly through a (toll) gate. A crucial condition to remain the obvious choice for exporters (Delaney, 2016, p.344) is that forwarders will need to adapt and evolve as emphasized by several experts.

5.2 Not a talk of the town

The second conclusion made is that blockchain is not on top of mind among forwarders in Shanghai. Evidence for that is found in three out of 39 respondents who declared to participate in a chain. Over three fourths of respondents are not aware what blockchain can do for them and limited knowledge was qualified as most important barrier. Moreover, respondents' comments during data collection and low questionnaire response rate are considered supplementary confirmations blockchain is currently not a topic of concern. Interviewees acknowledged that the technology is in its emergent state by using words like experimental, pilots, among others.

Even so, it seems practitioners feel something is coming. Only two questionnaire participants disagreed that their business model requires change when blockchain applications are around and none of the respondents indicated that blockchain will be unimportant to earn a profit in future. This estimate seems sound as blockchain's design hits the core of classic freight forwarders value proposition.

It is not too early for practitioners to go out on a discovery for customer issues to be addressed in a blockchain environment. Waiting for a customer call before familiarizing with the technology does not seem the right approach. Customers are not in the best position to know what to ask for and how to apply 'blockchain' in the area of freight forwarding. After all, export expertise offered by forwarders is the reason for shippers to outsource this non-core activity. Rather, forwarders should think of applications powered by blockchain technology which customers (and forwarders alike) did not know existed. One of the experts reminded competing on cost only is out and digitization is in. Providers who do not embrace have little future (E1).

5.3 Gaps

Laying down several gaps between expert theory and real life action in Shanghai forms the third conclusion. Most important gaps are identified here; addressing them will be the next step.

Overall understanding of Blockchain

While authors and experts talk about cultural resistance, chain governance, and smart contracts, practitioners in Shanghai perceive limited knowledge as most important barrier. Cultural issues and governance were ranked 7 and 8 (out of 10) respectively.

Distance technical capability and users

Despite the emergent state of blockchain, experts as well as authors comment that it is technically possible to employ certain blockchain applications in the maritime field. In Shanghai practitioners rank technical readiness as third most important implementation barrier and IT companies are considered most important stakeholder for their own involvement. Yet, only 28% of the respondents indicated to have discussions with IT companies related to blockchain. Consequently, the technology is available, forwarders consider it important to generate profits in future but discussions with the party deemed most important for blockchain to materialize are limited. This manifestation supports the discussion of innovation among service providers outside customer requirements from paragraphs 4.5.4 and 4.7.3. Nonetheless additional research is required to find out what could be the exact reason for this discrepancy.

Changing tasks

Authors and experts noted that trade documents are a key candidate to be exchanged on a chain. Practitioners consider this a less obvious functionality. Possibly practitioners are constrained by reality, on the other hand this functionality is still to be discovered by forwarders. Questionnaire respondents perceive placing and receiving cargo bookings,

obtaining insurance and performing custom clearance as more suitable candidates. Forwarders also place less importance on the banking function (placed last among likely tasks to be performed on a chain) then experts who highlighted this naturally.

What's next?

The crux to address some of the gaps between academic thinking and practical application as identified above seem to lay in conducting active explorations by practitioners as well as experts. Based on literature, interviews and own logic some suggestions are made here. Future research could be dedicated to determine detailed courses of action to close these gaps.

Mougayar (2016, p.61*) noted it is better to shoot yourself in the foot, rather than have someone else shoot you in the head. Probably the safest place to learn along the way is an environment where experiments and try-outs are promoted. Various authors use the term sandbox strategy (Nordberg, 2019; Mougayar, 2016, p.92*; Casey and Vigna, 2018, p.232*) to encourage blockchain development. Practitioners could also bond as proposed by E4. Moreover practitioners and experts alike could connect through abundant shipping knowledge centers or blockchain development initiatives in Shanghai. This would facilitate diffusion to the practical levels. Blockchain education of practitioners by practical oriented researchers would contribute to the goal of Shanghai to be a leading shipping center. The options are plentiful; the point is to start moving.

Based on the explorations reported in this paper it is likely blockchain technology will shift into the container of forwarder capabilities pictured in chapter two somehow. Although active and broad engagement among forwarders was not ascertained forwarders estimate its coming, evidenced by the importance placed on blockchain technology for being profitable in future.

5.4 Limitations and future research

Some shortcomings of this study should be taken into account. Low response rate is among the most important matters. Perception on blockchain technology among non respondents might differ from those who participated in the survey. Possibly more forwarders then the one cited in paragraph 4.1 are ‘not involved in blockchain’ and therefore decided not to participate in the survey. This problem might impact the overall picture. Moreover, responses represent a snapshot of forwarders attitudes in time.

Then, the questionnaire was distributed among SIFFA members only. In doing so, I have probably omitted the reservoir of small players not represented by SIFFA operating in Shanghai. It would be interesting to hear from them as major but underrepresented occupational group within. This category could be the focus for future study, in general or in relation to blockchain. Future research could also zoom in on LSPs and blockchain to try and obtain considerations among frontrunners. Applying such narrow foci within the industry would possibly crystallize the status of blockchain technology among segments. In general the use of case studies would assist to gain in depth knowledge from practitioners which could be considered by others.

Similarly interesting would be to learn from shippers and their blockchain explorations in relation to logistics and forwarding. What do cargo owners expect? What are their new problems? And what is their state of familiarity with the technology?

Finally the majority of interviewees are not from China. Looking back I consider this as strength, possibly I have missed typical characteristics of the Chinese forwarding market.

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List of Appendices

Appendix I, blockchain terminology

Collected by me from various sources

Distributed Software Architecture
Network of nodes connected with each other without center-point. Absence of a central node (or 'single point of failure') increases reliability and the network can grow by connecting more nodes. Malicious nodes might try and access the network to access and misuse information.

Centralized Software Architecture
Nodes are connected with the central node. Coordination is easy and organized through central node rather than the individual members of the network. A centralized architecture can grow only if a more powerful central unit is employed.

Purely Distributed Peer to Peer System
A type of distributed software system in which the capabilities of individual nodes (storage, power, among others) are made available to all the other nodes in the network. Nodes (users) might contribute different resources they have the same responsibility. Bitcoin is a prime example of such a system.

Centralized (distributed) Peer to Peer System
Employs a central node in a distributed system facilitating interactions between peers. For example a central database of aggregated records offered by individual peers.

Software Integrity
Means that the software does what it should do (behavioral integrity), that the data in the software system is accurate (data integrity) and the system is secured (security integrity).

So what?
A network which allows everyone to join freely (a purely distributed peer to peer network) lacks integrity. It is vulnerable for malicious peers or technical errors as on-boarding or selection processes are not in place. The (number of) members are unknown. A predefined set of (moral) standards is not available. A blockchain can be the tool to achieving integrity in distributed software systems. The problem of integrity in a purely distributed peer to peer software system (made up of potentially unreliable and untrustworthy members) is also called the **'***byzantine generals problem'.*

Blockchain
Tool to achieve and maintain integrity in purely distributed peer to peer systems without any centralized control or coordination. According to various authors blockchain's ability to achieve integrity create the potential to change industries.

Identity or privacy and blockchain
Tencent, Google, Facebook, are some organizations centrally controlling personal data. Issues related to vast quantities of personal data collected and stored by such organizations can be resolved through blockchain technology. It does not need to know who anybody is by the use of public and private keys. So how about openness and transparency often argued as benefit? Confidentially can be achieved by encrypted transfer of items and 'zero knowledge schemes'.

Smart Contracts
Introduced by Nick Szabo in 1994. A way to assign usage rights to the other party. Smart contracts allow to execute, enforce and settlement of recorded agreements. This can be achieved by linguistic or nonlinguistic (sensors) information.

Smart property
Digitized version of a tangible or non tangible asset which has value and specific rights to use (otherwise it is not an asset). Examples include a song, house or slots on a container vessel.

Bitcoin
The first application of blockchain invented by a person or group under the pseudonym Satoshi Nakamoto in 2009. Bitcoin is a digital currency, transferrable on the blockchain and issued nor backed by a central bank. Sending and receiving coins on the public (verified) ledger (blockchain) prevents the computer file from being used multiple times (double spending) and allows to track ownership from the creation of a coin through every subsequent transaction. Bitcoins are sent and received from and to alphanumeric character strings; a public key address similar to the function of an email address. A transaction is undersigned by the senders' private key. The sender of amount of bitcoins broadcasts a transaction to the entire bitcoin network (not to a centralized identity) and the network verifies if the bitcoins to be sent are actually controlled by the sender and that the sender authorized that specific transaction.

Altcoin
Alternatives digital currencies (crypto currencies) existing next to the bitcoin.

Mining
Individuals or companies who dedicate computer power to maintenance of the public ledger through verification, ordering and recording of payments (solving mathematical problems) are called miners.

Miners 'race' to broadcasted unordered and unrecorded transactions and transfer those into ordered and recorded transactions so the transaction can be included to the next block. Miners race because transferring unordered and unrecorded transactions into ordered and recorded transactions (for which computing power is required) are rewarded in bitcoins. In other words, mining is both the creation of new bitcoins as well as the process of adding new blocks of transactions to the bitcoin blockchain; updating the public ledger. When a miner successfully solved the math problem, the 'proof of work' is broadcasted to the other miners who accept the solution by focusing on the next block to be added.

Proof of work
Adding new blocks to the chain requires agreement of all peers; in other words, the data needs to be the same on every single node in the network (in blockchain language this is called the consensus mechanism). Proof of work is such a mechanism; it requires execution of an algorithm.

The problem of Privacy
The other core feature of the blockchain (in purely distributed peer to peer systems) is its transparency. The register of transactions is *'readable'* for every user, peer or node. It is visible for every peer to allow every peer to add (and verify) new blocks to the chain. In other words, the openness is constituted in the design.

Blockchain Purists
Support the open, purely distributed and peer to peer character of the system. They claim compromises to security (conflicting with processing speed) and transparency (conflicting with privacy) will harm the purpose of integrity. Purists' dispute using the term blockchain on any restricted/compromised system.

Relaxing the principles of reading the blockchain; public versus private chains, and relation to scalability
Public chains, allow free reading access to all nodes, users or participants.
Private chains, allow reading access to selected nodes, users or participant.

Relaxing the principles of writing to the blockchain; permissionless versus permissioned chains
Permissionless chains, allow free writing access to all nodes, users or participants.
Permissioned chains, allow writing access to selected nodes, users or participant.

Combining these restrictions result in four types of blockchains; public and permissionless chains (purest form of a blockchain applied to crypto-currencies), public and permissioned chains, private and permissionless chains and private and permissioned chains (most restricted form of a blockchain and considered most useful for commercial use).

ICO Initial Coin Offering
Simply put, an ICO is a blockchain based mechanism comparable with crowd funding campaigns or IPOs (Initial Public Offerings). The public can purchase stakes in the company, it is open for everyone. The investor receives tokens (comparable with stocks) in return; banned in China.

Flat currency
Term used in blockchain and crypto currency community to indicate 'real' money (RMB, USD, EUR, RMB, etc).

Ethereum
Platform which can not exclusively transfer transactions of monetary value (like Bitcoin) but also includes the application of transmitting data and inclusion of smart contracts.

Crypto currency exchange
Market place comparable with a stock exchange where buyers and sellers trade crypto- for crypto currencies or flat currencies. Exchanges appear in 'traditional form' (a middle man facilitating trade) or in 'direct', peer to peer form; banned in China.
(www.cryptocurrencyfacts.com)

Algorithm / Hash
A series of instructions to explain step by step which mathematical actions have to be executed; from a given start to a certain goal. A standard algorithm is run over any file to compress the file into a unique 64 character code. Every file has its own unique code, and based on the code it is not possible to access or open the file. The code is called a 'hash'; it is included on a blockchain transaction and is time stamped. This procedure is the proof this digital asset now exists. The hash can be recalculated from the underlying file (stored on the privately owned computer, not blockchain), confirming that the original content did not change.

Hyperledger
Distributed ledger technology platform founded by the Linux Foundation, or a 'permissioned blockchain' (thus not a blockchain in its purest form). It (centrally) governs updates of applications (DApp's) employed on its platform. Industry characteristics are standardized; network members are identifiable and verified (unlike permissionless blockchains like bitcoin or ethereum which are open for everyone).

Cryptography
The coding or decoding of messages in a 'secret' code

DApp's, Decentralized Applications
While 'traditional' applications (Wechat, Facebook, Uber, etc) are hosted and controlled centrally, DApp's are distributed application; not owned or hosted by a single entity. In its purest form users decide on improvements by majority consensus.

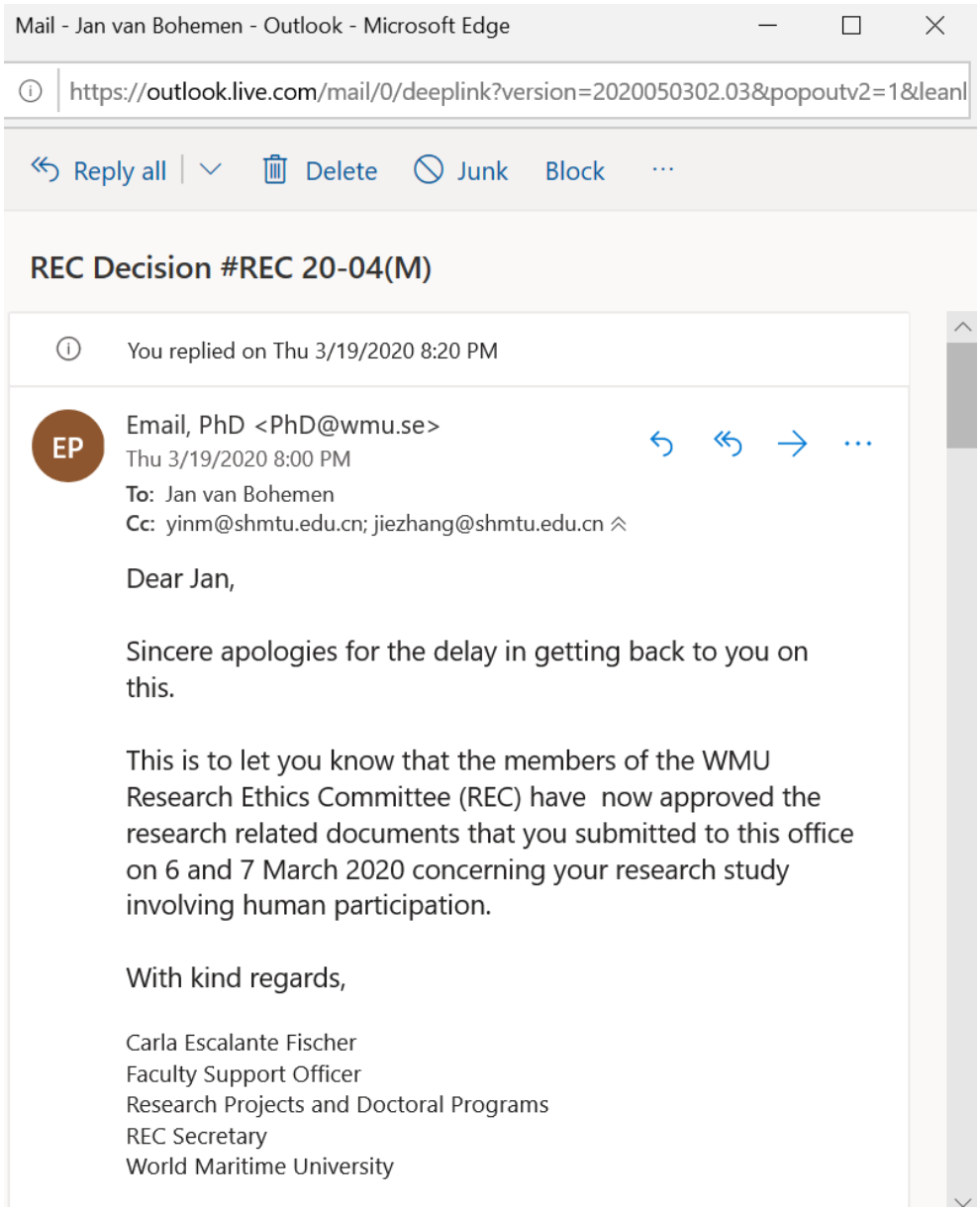
SHA256
Secure Hash Algorithm, a cryptographic marking function, the 'digital fingerprint' of a piece of data of 64 bits

API's, Application Programming Interfaces
Tools facilitating developers to build applications access and manage digital assets. Oversimplified; when an application developer is a cook preparing a dish, ingredients are his API's.

Low context communication
Few reference points and little implicit knowledge. Communication must be simple, clear and explicit. 'Tell them what you are going to tell them, then tell them, then tell them what you've told them'.

High context communication
Many reference points and al lot of implicit knowledge. ‘No, thank you’ means, ‘please ask me again because I am starving’

Appendix II, REC approval



Mail - Jan van Bohemen - Outlook - Microsoft Edge

https://outlook.live.com/mail/0/deeplink?version=2020050302.03&popoutv2=1&leanl

Reply all | Delete | Junk | Block | ...

REC Decision #REC 20-04(M)

You replied on Thu 3/19/2020 8:20 PM

EP

Email, PhD <PhD@wmu.se>
Thu 3/19/2020 8:00 PM

To: Jan van Bohemen
Cc: yinm@shmtu.edu.cn; jiezhang@shmtu.edu.cn

Dear Jan,

Sincere apologies for the delay in getting back to you on this.

This is to let you know that the members of the WMU Research Ethics Committee (REC) have now approved the research related documents that you submitted to this office on 6 and 7 March 2020 concerning your research study involving human participation.

With kind regards,

Carla Escalante Fischer
Faculty Support Officer
Research Projects and Doctoral Programs
REC Secretary
World Maritime University

Appendix III, Interviewee consent form and interview questions

Consent form:

Consent form to be signed by subjects

Dear Participant,

Thank you for agreeing to participate in my research survey, which is carried out in connection with a Dissertation which will be written by the interviewer, in partial fulfilment of the requirements for the degree of Master of Science in International Transport and Logistics at Shanghai Maritime University in collaboration with the World Maritime University in Malmo, Sweden.

The topic of the Dissertation is '*Blockchain technology; empirical study on considerations among freight forwarders in Shanghai*'

The information provided by you in this interview will be used for research purposes and the results will form part of a dissertation, which will be published online and made available to the public. Your personal information will not be published. You may withdraw from the research at any time, and your personal data will be immediately deleted.

Anonymised research data will be archived on a secure virtual drive linked to a World Maritime University email address. All the data will be deleted as soon as the degree is awarded.

Your participation in the interview is highly appreciated.

Student's name	Johannes van Bohemen
Specialization	International Transport and Logistics
Email address	201934841017@stu.shmtu.edu.cn

• • •

I consent to my personal data, as outlined above, being used for this study. I understand that all personal data relating to participants is held and processed in the strictest confidence, and will be deleted at the end of the researcher's enrolment.

Name: .....

Signature: .....

Date: .....

Interview questions:

WMU

INTERVIEW QUESTIONS

Question 1
Will blockchain have the potential to change or transform international trade practices? Why?

Question 2
Why would blockchain have an impact on freight forwarders?

Question 3
How would this potentially have an impact of freight forwarders?

Question 4
Do you expect the functionalities of blockchain will eliminate the role for forwarders with blockchain?

Question 5
Which central tasks of freight forwarders will potentially change, with the emergence of blockchain?

Question 6
What will be the future business model of freight forwarders in relation to the introduction of blockchain technology?

Question 7
What should forwarders do to get there?

Question 8
Would you comment on the development of privately initiated and public blockchains, for example by carriers. Should private chains be considered as a threat for forwarders?

Question 9
What would be the primary two benefits and barriers to full scale blockchain application in the logistics/shipping context?

Appendix IV, Questionnaire, English and Chinese

English version questionnaire:

Survey on application of Blockchain Technology in the Freight Forwarding Industry in Shanghai

This is a survey on blockchain technology in relation to freight forwarding in Shanghai. I am conducting this research in relation to a Masters study at Shanghai Maritime University; and I would like to invite you to participate. Completing this questionnaire will take a few minutes.

The survey consists of two parts. The first part (question 1 till 7) asks some general questions about your company, your position and business activities. The second part (question 8 till 24) will ask questions related to your company in relation to blockchain technology. All questions are multiple-choice.

Thank you very much for taking the effort to complete this survey!

Participation is anonymous and please make sure answers correspond with the actual situation, this is not a test.

Question 1

Please indicate in which year, your organization started business operations

- O Prior to 1990
- O 1990 – 1995
- O 1996 – 2000
- O 2001 – 2005
- O 2006 – 2010

- O 2011 – 2015
- O 2016 – 2020

Question 2

Please indicate the number of employees in your company (从业人员)

- O Less than 20 (micro)
- O 20 – 299 (small)
- O 300 – 999 (medium)
- O More than 999 (large)

Question 3

Please indicate your position

- O Intern
- O Entry Level
- O Analyst / Associate
- O Manager
- O Senior Manager
- O Director
- O Vice President
- O Senior Vice President
- O C level executive (CIO, CTO, COO, CMO, Etc)
- O President or CEO
- O Owner
- O Other

Question 4

Please indicate years of experience in forwarding and or logistics

- O Less than 5 years
- O 5 – 9 years
- O 10 – 14 years
- O 15 – 19 years
- O 20 – 24 years

- O Over 24 years

Question 5

Please indicate revenue from ocean freight forwarding as percentage of total revenue

- O 0 – 24%
- O 25% - 49%
- O 50% - 74%
- O More than 74%
- O I don't know

Question 6

Please indicate revenue from air freight forwarding as percentage of total revenue

- O 0 – 24%
- O 25% - 49%
- O 50% - 74%
- O More than 74%
- O I don't know

Question 7

Please indicate sources of revenue

Multiple answers possible

- O Forwarding services associated with ocean transport
- O Forwarding services associated with air transport
- O In house logistics services
- O In house customs broker services
- O In house broker services
- O In house NVOCC services
- O Others

Question 8 **RQ3 / RQ6**

Does your company currently participate in a blockchain development project?

- O Currently we do
- O We plan to do within one year
- O We currently do not have a plan to participate in a blockchain project

Question 9 **RQ3 / RQ2**

I expect blockchain will have an impact on our organization

Choose one option from strongly disagree to strongly agree

strongly disagree	disagree	neutral	agree	strongly agree
O	O	O	O	O

Question 10 **RQ3**

Currently I am uncertain what blockchain can do for my company

Choose one option from strongly disagree to strongly agree

strongly disagree	disagree	neutral	agree	strongly agree
O	O	O	O	O

Question 11 **RQ5**

Blockchain will change my business model

Choose one option from strongly disagree to strongly agree

- O **strongly disagree**
- O **disagree**
- O **neutral**
- O **agree**
- O **strongly agree**
- O **If possible please specify an example of a new service a freight forwarder could offer with blockchain technology _____-**

Question 12 **RQ2**

Blockchain technology is an opportunity for my business

Choose one option from strongly disagree to strongly agree

strongly disagree	disagree	neutral	agree	strongly agree
O	O	O	O	O

Question 13 **RQ2**

Blockchain technology is a threat for my business

Choose one option from strongly disagree to strongly agree

strongly disagree	disagree	neutral	agree	strongly agree
O	O	O	O	O

Question 14 **RQ2 / RQ3**

How important is blockchain technology to be a profitable freight forwarder?

Choose one option from very important to very unimportant

Very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Question 15 RQ2

Blockchain technology will eliminate the role of freight forwarders

Choose one option from strongly disagree to strongly agree

strongly disagree	disagree	neutral	agree	strongly agree
O	O	O	O	O

Question 16 RQ2

Carriers perceive freight forwarders as a means for selling their capacity

Choose one option from strongly disagree to strongly agree

strongly disagree	disagree	neutral	agree	strongly agree
O	O	O	O	O

Question 17 RQ2

What is the ***primary*** reason for customers to use your services?

Please choose only one

- O Variety of services offered
- O Service level offered
- O Knowledge
- O Price
- O Guanxi, personal relations
- O Oher reason please specify _____

Question 18 RQ3

<u>Benefits of blockchain technology</u>

This question consists of perceived benefits of blockchain technology. Please indicate for every single benefit how important you perceive this benefit. Benefits are randomly ordered

Choose one option from very important to very unimportant for every single benefit

Simplifies / reduces paper based processes

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Increases transparency

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Reduces fraud

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Increases trust

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Increases cyber security

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Tracking and tracing ability

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Quick access to information

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Improves customer service

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Tool to gain competitive advantage

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Efficient communication with other stakeholders

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Question 19 RQ3

<u>Barriers of blockchain technology</u>

This question consists of perceived barriers of blockchain technology. Please indicate for every single barrier how important you perceive this barrier. Barriers are randomly ordered

Choose one option from very important to very unimportant for every single barrier

Fragmented legal requirements across geographies

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Lack of standardization

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Interoperability between different blockchains

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Limited technological readiness

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Limited knowledge about blockchain technology

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Corporate cultural resistance

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Benefits not clear

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Lack of governance

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Learning and training will take time

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Lack of management support/resources

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Question 20 RQ4

Please indicate which of the below services your company offers

Multiple answers possible

- O We arrange cargo insurance
- O We prepare quotations
- O We arrange import/export customs clearance
- O We arrange documentation
- O We book space with carriers on behalf of our customers
- O We offer logistics services
- O We offer warehouse services
- O We advise and arrange packing
- O We arrange door delivery and pick up
- O We pay upfront expenses and collect afterwards
- O We consolidate cargo
- O We provide consultancy services
- O We actively inform our customers about status of cargo
- O We act as NVOCC
- O Other

Question 21 **RQ4**

<u>Activities which have the potential to be performed on a blockchain</u>

Please indicate per activity if you think a blockchain can execute these activities. Activities are randomly ordered

Choose one option from strongly disagree to strongly agree for every single activity

Send and receive bookings for shipment

strongly disagree	disagree	neutral	agree	strongly agree
O	O	O	O	O

Send and receive quotations

strongly disagree	disagree	neutral	agree	strongly agree
O	O	O	O	O

Arrange import/export clearance

strongly disagree	disagree	neutral	agree	strongly agree
O	O	O	O	O

Obtain cargo insurance

strongly disagree	disagree	neutral	agree	strongly agree
O	O	O	O	O

Perform the functions of a bill of lading

strongly disagree	disagree	neutral	agree	strongly agree
O	O	O	O	O

Perform the functions of original documents (certificate of origin, veterinary documentation, consular documents, letter of credit, and others)

strongly disagree	disagree	neutral	agree	strongly agree
O	O	O	O	O

Make and receive payments

strongly disagree	disagree	neutral	agree	strongly agree
O	O	O	O	O

Question 22 **RQ3 / RQ6**

<u>Other market players</u>

Please indicate per market player how important their involvement is for your involvement in blockchain technology. Market players are randomly ordered

Choose one option from very important to very unimportant for every single market player

Cargo owners

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Competitors

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Carriers

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Port authority

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Terminal operators

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Customs

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Government and regulators

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

IT Companies

very important	important	neutral	unimportant	very unimportant
O	O	O	O	O

Question 23 **RQ6**

Please indicate the adoption approach your organization employs in relation to implementation of inter organizational systems

- O We are deliberate decision makers, we have a long term, planned and rational approach when it comes to adoption of inter organizational systems
- O We are emergent decision makers, we take ad hoc decisions aimed to fit constantly evolving environmental changes when it comes to adoption of inter organizational systems
- O Other

Question 24 RQ6

Please indicate how your business is trying to gain knowledge about blockchain

Multiple answers possible

- O Through our designed continuous learning culture
- O Conducting pilot projects
- O Hire a consultant
- O Hire skilled staff
- O Actively select and attend blockchain technology seminars
- O Through structured discussions with ICT supplier
- O Read industry press
- O By establishing an internal project group
- O By sending staff to training
- O We currently do not actively employ activities to gain knowledge about blockchain
- O Other means, please specify _____

END

Chinese version questionnaire:

区块链技术发展对上海国际货运代理行业影响的调查

您好，我们是上海海事大学的学生，我们正在进行一项有关区块链技术的问卷调查，想邀请您用几分钟的时间帮忙填写这份问卷。该问卷包含两个部分：第一部分为一般性问题，询问有关您的公司、所在职位及公司商业活动(问题 1 至 7)。第二部分将询问与您公司有关的区块链技术问题(问题 8 到 24)。以下部分问题为多项选择题。本问卷实行匿名制，所有数据只用于统计分析，请您按实际情况放心填写。

谢谢您的帮助!

1. 请问您的公司是哪一年成立的？ [单选题] *

o1990 年之前

o1990 – 1995 年

o1996 – 2000 年

o2001 – 2005 年

o2006 – 2010 年

o2011 – 2015 年

o2016 – 2020 年

2. 请问您公司的职员人数？ [单选题] *

o少于 20 人(微型)

o20 – 299 人(小型)

o300 – 999 人(中型)

o多于 999 人(大型)

3. 请问您所在的职务？ [单选题] *

o实习生

o初级雇员

o分析师/助理

o经理

o高级经理

o主管/总监

o副总裁

o高级副总裁

oC 级主管(首席信息官、首席技术官、首席运营官、首席营销官等)

o总裁或者首席执行官

o公司所有者

o其他

4. 请问您从事物流行业的时间？ [单选题] *

o不到 5 年

o5 – 9 年

o10 – 14 年

o15 – 19 年

o20 – 24 年

o超过 24 年

5. 请问您公司的海运代理收入占总收入的百分比？ [单选题] *

o0 – 24%

o25% - 49%

o50% - 74%

o超过 74%

o我不了解

6. 请问您公司的航空货运代理收入占总收入的百分比？ [单选题] *

o0 – 24%

o25% - 49%

o50% - 74%

o超过 74%

o我不了解

7. 请问贵公司的收入来源？（多选题) [多选题] *

□海运代理业务

□空运代理业务

□自营物流业务

□自营报关业务

□自营经纪业务

□自营无船承运人业务

□其他

8. 贵公司目前是否参与区块链发展项目？ [单选题] *

o目前在参与

o一年内考虑参与

o目前无计划参与区块链项目

9. 预计区块链将对我的公司产生影响

您对此观点看法如何，请按同意程度从下列选项中选择一项

[单选题] *

o强烈反对

o反对

o中立

o同意

o非常同意

10. 目前我不确定区块链可以为我公司做些什么

您对此观点看法如何，请按同意程度从下列选项中选择一项

[单选题] *

o强烈反对

o反对

o中立

o同意

o非常同意

11. 区块链将改变我公司的商业模式

您对此观点看法如何，请按同意程度从下列选项中选择一项[多选题] *

□强烈反对

□反对

□中立

□同意

□非常同意

□可否举例说明一种货运代理商可以运用区块链技术的新服务 _____

12. 区块链技术对我公司业务来说是机会

您对此观点看法如何，请按同意程度从下列选项中选择一项

[单选题] *

o强烈反对

o反对

o中立

o同意

o非常同意

13. 区块链技术对我公司业务构成威胁

您对此观点看法如何，请按同意程度从下列选项中选择一项

[单选题] *

o强烈反对

o反对

o中立

o同意

o非常同意

14. 区块链技术对于成为一个盈利的货运代理商有多重要？

您对此观点看法如何，请按同意程度从下列选项中选择一项[单选题] *

o非常重要

o重要

o中立

o不重要

o非常不重要

15. 区块链技术将削弱货运代理的作用

您对此观点看法如何，请按同意程度从下列选项中选择一项[单选题] *

o强烈反对

o反对

o中立

o同意

o非常同意

16. 承运人将货运代理视作销售渠道之一

您对此观点看法如何，请按同意程度从下列选项中选择一项

[单选题] *

o强烈反对

o反对

o中立

o同意

o非常同意

17. 客户选择您公司服务的主要原因是什么？（单选） [单选题] *

o提供的服务种类多

o提供的服务水平

o知识

o价格

o关系/个人关系

o其他原因请注明 _____

18. 区块链技术的优势

此问题包含区块链技术带来的优点。请指出每项优点的重要性，列举的各项优点顺序随机。

每项优点的重要性程度从非常重要到非常不重要，请在下列选项中选择一项[矩阵单选题] *

	非常重要	重要	中立	不重要	非常不重要
简化/减少书面流程	o	o	o	o	o
增加透明度	o	o	o	o	o
减少欺诈	o	o	o	o	o
增加信任	o	o	o	o	o

提高网络安全性	○	○	○	○	○
追踪追溯能力	○	○	○	○	○
快速访问信息	○	○	○	○	○
改善客户服务	○	○	○	○	○
是获得竞争优势的工具	○	○	○	○	○
能与其他权益相关者进行有效沟通	○	○	○	○	○

19. 区块链技术的障碍

此问题包含区块链技术的障碍。请指出每个障碍的重要性，各项障碍的列举顺序随机。每项障碍的重要性程度从非常重要到非常不重要，请在下列选项中选择一项[矩阵单选题]

*

	非常重要	重要	中立	不重要	非常不重要
各地区法规异质性	O	O	O	O	O
缺乏标准化	O	O	O	O	O
不同区块链之间的互用性	O	O	O	O	O
技术准备有限	O	O	O	O	O
对区块链技术的了解有限	O	O	O	O	O
企业文化抵制	O	O	O	O	O
优点不明确	O	O	O	O	O
缺乏治理	O	O	O	O	O

培训及学习需要时间	o	o	o	o	o
缺乏管理支持/资源	o	o	o	o	o

20. 请指出贵公司提供以下哪些服务（可能有多个选项） [多选题] *

□我们安排货物保险

□我们准备报价

□我们安排进出口清关

□我们准备文件

□我们代表客户与承运人订舱

□我们提供物流服务

□我们提供仓库服务

□我们提供建议并安排打包

□我们安排上门送货和取货

□我们垫付运费

□我们集拼货物

□我们提供咨询服务

□我们积极告知客户货物的状态

□我们担任无船承运人

□其他

21. 有可能在区块链上执行的活动

如果您认为区块链可以执行这些活动的话请指明您的同意程度。活动的列举顺序随机

对每个活动的同意程度从强烈反对到非常同意，请在下列选项中选择一项[矩阵单选题] *

	强烈反对	反对	中立	同意	非常同意
发送和接收航次预定	○	○	○	○	○
发送和接收报价	○	○	○	○	○
安排进出口清关	○	○	○	○	○
获取货物保险	○	○	○	○	○
执行提单	○	○	○	○	○

功能					
执行原始文件的功能（原产地证明、检验检疫文件、领事文件、信用证明等其它）	o	o	o	o	o
付款和收款	o	o	o	o	o

22. 其他市场参与者

请指出其他市场参与者对您参与区块链技术的重要性。市场参与者的列举顺序随机

重要性程度从非常重要到非常不重要，请在下列选项中选择一项[矩阵单选题] *

	非常重要	重要	中立	不重要	非常不重要
货主	o	o	o	o	o
竞争者	o	o	o	o	o
承运人	o	o	o	o	o

港口经营人	o	o	o	o	o
终端运营商	o	o	o	o	o
海关	o	o	o	o	o
政府和监管部门	o	o	o	o	o
信息技术公司	o	o	o	o	o

23. 请指出贵公司采用区块链技术时所选择的方法 [单选题] *

o我们是深思熟虑的决策者，在采用跨组织系统时，我们采用长期、有计划和合理的方法

o我们是紧急的决策者，在采用跨组织系统时，我们会做出旨在适应不断变化的环境的临时决定

o其他

24. 请指出贵公司在获取有关区块链知识时所采用的方法（多选题） [多选题] *

□通过公司构建的继续教育文化

□开展试点项目

□聘请顾问

□雇用具备熟练技能的员工

□积极参加区块链技术研讨会

□与信息通信技术供应商的结构化讨论

□阅读行业新闻

□建立公司内部项目组

□派遣人员参加培训

□我们目前未积极开展用来获取区块链知识的活动

□其他方式，请注明 _____

END