Thesis

Effects and Potential Repercussions of Blockchain Implementation on International Trade for Micro, Small and Medium Enterprises in Turkey

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Abstract: Blockchain is fairly new technology and it quickly became a very trendy topic among many different parties from governments to large enterprises. As President Xi also emphasized by saying “China Should ‘Seize Opportunity’ to Adopt Blockchain” we can see the importance of this technology for all the nations. We first heard about it with Bitcoin digital currency, however blockchain’s applications are way wider than just digital currency. At the current date there are numerous application attempts from financial industries, to insurance companies all the way to international trade. While many different groups are trying to use this technology to tackle different problems, international trade applications stand in the front line, current outdated and paper heavy state of international trade along with rapidly speeding up globalization creates a great need for an update on current international trade model. As the share in the global trade is one of the biggest factors for countries who would like to stay in global race, many countries are looking for different applications to gain an advantage. More aggressive, less stable and easy to adopt nature of emerging countries makes them more suitable for implementing new type of technologies and Turkey is one of those emerging countries who would like to catch up with developed countries in global trade race. Turkey believes key to excel and increase the share of Turkey in world trade is strongly related to performance of Micro, Small and Medium enterprises within Turkey. (SME Action Plan, 2015-2018) Because of still under development nature of Turkish trade and finance ecosystem Turkish MSMEs face more significant difficulties comparing to developed nations. Aligned with Turkey’s action plans with this research paper, we will first try to understand the current situation and problems of Turkish MSMEs then find out in which areas can blockchain technology improve. After these two understandings we will craft and test the different hypothesizes around how and where can blockchain technology can help Turkish MSMEs to improve their contribution in international trade. Later using induction method, we will try come up with suggestions for other developing countries.

Keywords: Blockchain Technology, International Trade, Turkey, MSME
INTRODUCTION

With the globalization cross-border trade become a must for the countries who opened their economies to globe. Each country uses its best abilities to increase their cross-border trade in other way of saying exports to support their countries’ economic growth. As we all know this growth depends on various variables however, importance of international trade for each country is a critical one to compete in global competition.

Each country uses their resources to maximize gains from the international trade unless they are a closed economy. According to WTO’s statistics in almost every country 95% of all companies are MSMEs. On the other hand these MSMEs provide 60% of employment in developed nations and 80% of employment in developing nations. Just MSMEs generates 60 to 70% of global GDP. (WTO, 2017) When we consider these statistics it is much clear that for each country and specially for developing countries MSMEs has tremendous effects on the economic growth. Also the importance of MSMEs come from several reasons: first of all they have better potential to create jobs comparing other companies; they can do more production with lesser investment; they are more sensitive with bank affairs; they are more easy to adept to cross-border trade and most importantly their flexible nature allows them be more open technological developments when there are opportunities. For these reasons, many developing countries are focusing on creating better conditions for MSMEs in their countries with the goal of creating a better economy.

One of the parts where countries work hard to improve is international trade participation of MSMEs. According to World Bank Enterprise Surveys, which was conducted on over 25,000 MSMEs in developing countries, direct exports are equal for only 7.6% of total manufacture sector. Research conducted by OECD also proved even OECD countries situation is not different, in these countries MSMEs count for around 95% of all companies however, their contribution overall export is around 20%-40% in most of OECD countries. Relative to their share in economy and overall activities conducted by MSMEs still the proportion of exports from these companies are dramatically low. There are many reasons behind why MSME has this low rate of participation. Major reasons are limited to access information, high cost of trade, human and financial resource limitations, paper heavy nature of trade, limits on trade financing and risks related currency exchange etc. These problems exist for all countries and unless countries specially developing
countries find solutions to these problems, it’s very hard for them to change the contribution of MSMEs in international trade.

A founder member of OECD and still which can consider a developing country, Turkey is a great example who is experiencing these very problems. With the light of globalization Turkey started to have open economy since 1980s and started to issue policy regarding becoming a truly open economy. With Turkey’s adaptation efforts to EU Turkey quickly realized the importance of SMES in the economy and international trade and created the KOSGEB which stands for small and medium enterprise support and development department (SMESDD). This department works on problems of MSME in Turkey and trying to make conditions more suitable for growth of the economy. Along with this initiative Turkish Ministry of Science, Manufacture and Technology publishes actions plans to inform their activities on assisting MSMEs. It will be accurate to say that Turkey is aware of these problems and looking for solutions to tackle these problems to achieve a competitive stance in world trade.

While many countries are searching for these solutions just like Turkey, recently there was a technological breakthrough which became the second most important development since the invention of internet, and it is called blockchain technology. We first heard about this technology with popular digital currency Bitcoin however, applications of this technology is much more than just a digital currency. Early applications were mainly focused on finance industry however in recent years applications on supply chains and trade-related business process rapidly gained ground. These new applications quickly took attention of many large companies and governments and investments quickly reached 1 billion USD in 2017. (CB Insights, 2018). This rapidly developing and highly anticipated technology may offer countries to solve their problems related to MSMEs contribution to international trade.

In this very paper we will looking into possibilities that blockchain offered to solve MSME problems. To make our research more accurate and more applicable we will use Turkey and Turkey’s MSMEs and their problems as a case study. We will first understand Turkey’s MSME structure and their problems later on we will examine blockchain technology and understand the details and problems of it. After we establish great understanding of both blockchain technology
and Turkish MSME structure, we will be creating and testing different hypotheses to see how blockchain solutions can benefit Turkish MSMEs and can these solutions really increase MSMEs’ participation to international trade in Turkey.

1. EXPLANATION OF THE RESEARCH

1.1. Topic of the Research

On the research paper called “Effects and Potential Repercussions of Blockchain Implementation on International trade for micro, small and medium enterprises in Turkey” first definitions and details of MSMEs in Turkey and blockchain is given. The following chapter consist of hypothesis crafting. Next using data from various resources these hypotheses are tested with given conditions. At the end using the results of hypothesis testing conclusion and suggestions are given.

1.2. Aim of the Research

First, this article wants to establish an understanding of blockchain technology and its possible applications in international trade. With the detailed study and hypothesis crafting around implementation of blockchain technology to Turkey’s MSME environment in order to observe its affect to international trade, we aim to give an idea to other parties who would like to use this technology in international trade. Different hypothesis had been created with in the research paper around Turkey’s case study to find out possible outcomes of blockchain implementation in international trade for developing countries. Focus of the paper was MSMEs to show where this implementation can be most effective. Lastly, this article shows how new technological advancements can be solution to long term old problems when problem and target market is well defined.

1.3. Importance of this Research

In the constantly changing technology era, whether you are company or government, everyone needs to stay on competition. This is only possible and achievable if we ask right questions at right spots about new advancements. This research paper and similar other researches will be asking these questions to find ultimate solutions to be a guide to organizations and governments to pursue this new technology.
1.4 Materials and Methodology
Material collection is based on two different sources both primary and secondary resources has been used along this research paper. Primary research sources consist of Turkish government agencies such as TUIK, KOSGEB and aside from Turkish sources WTO and EU parliament publications has been used. As the secondary sources, research papers with focus on Turkish MSMEs and Turkish International trade has bene observed. Fundamental research used as a type of research. The design of the research follows the exploratory research model. The approach of research is deductive research approach, hypothesis was used in this basis. Using the induction method suggestions were made for other countries similar Turkey.

1.5 Scope and Limitations of the Research
This study’s scope is crafted to understand blockchain technologies implementation in MSME to see the effect on their participation in international trade, for this reason information related to blockchain and it is implementation on international trade has been used. The research does not cover all the other implementation of this technology and also implementation of the same technology on larger scale companies is not included within this research paper.

1.6. Literature Review
As the topic blockchain is a quite new technology with many possible applications, thus various public and private organizations have published tremendous amounts of papers regarding this trendy topic. Among the many available resources there were again significant amount of organization who give their focus on application of blockchain technology in international trade. This made finding resources for this research paper easy, however as there are various source for the information, finding the accurate and relevant information was challenging. To stay on the safe side and be more objective, I prioritize the resources from public organizations first and supported my research with many other secondary research papers relevant to studies topic.

- Can Blockchain revolutionize international trade? (Emmanuelle Ganne, World Trade Organization 2018)
  This paper holds a great importance for the research as it was updated, and the whole of focus of the paper on the application of blockchain technology in the international trade.
Another great point of this research paper was it was created by World Trade Organization, an entity which is objective and aware of current situation of the trade.

- The advent of blockchain in trade (Krisztina Binder and Angelos Delivorias, European Parliamentary Research Service 2018)
  The paper created the by EPRS is great summary for those who are looking to learn pros and cons of the blockchain in trade. Paper first touches the brief background of the technology later continues with blockchain’s possible use in trade and possible challenges it may face along the way.

- MSME Strategy and Action Plan – Kobi Strateji ve Eylem Planı (Ministry of Science Manufacturing and Technology of Turkey)
  On this action plan Turkish government reveals important stats regarding the current involvement of MSMEs in the economy and trade. Later on, paper discusses the action plans to execute between 2015 – 2018-year period.

- Akgemci, T. (2001). KOBİ’lerin Temel Sorunları ve Sağlanan Destekler, this publication shed a great light on the issues MSMEs are facing with in Turkey, sharing vital insights MSMEs are facing along with available government subsidies.

- Çalpinar, H.  and Baç, U. (2007). KOBİ’lerde İnovasyon Yapmayı Etkileyen Faktörler ve Bir Alan Araştırması, this article investigates the factors related to capability of MSME to innovate. To understand main driving factors affecting the innovation capabilities of MSMEs in Turkey.

  This paper investigates ways to improve participation of SME in global trade. Paper use OECD countries as sample to investigate the problems and solutions can be offired to increase participation rate of SME in global trade.

- Özgen, H. ve Doğan, S. (1998). Küçük ve Orta Ölçekli İşletmelerin Uluslararası Pazarlara Açılmada Karşılaştıkları Temel Yönetim Sorunlar, this study conducted by Ozgen and Dogan investigates the main issues SMEs face when they want to enter international markets. This study gives better understanding on issues SMEs face when they want to open to global markets.

- Uygun, M. ve Kazan, H. (2002). KOBİ’lerin Üretim Sorunlarının Tespiti ve Rekabet Güçlerinin Artırılmasında Teknoloji Faktörü, Study focuses to define and find out details
of production problems Turkish SMEs are facing when they want to improve or establish their production lines. This study helps this paper to further pinpoint the production-related issues that SMEs are facing.

2. UNDERSTANDING MSMEs IN TURKEY

2.1. The definition and Features of MSMEs in Turkey

In the past, small enterprises were seen as unsuccessful ventures, in today’s world this understanding is long gone, and small enterprises are a main focus of almost every country (Erkan, 1990: 23). The flexible and adaptable nature of these enterprises can adjust according to new development and advancements much more easily. The definition or perception of these enterprises may vary from country to country. The reason for this difference is, countries have different development levels and different economical standards and these variables maybe change the definition in each country (Akman, 2009: 1).

According to the most recent law published by the Turkish government on the year of 2017, the ministry of finance in Turkey defines micro, small and medium enterprises as entities that are employing less than 250 employees in annual basis and generating an annual revenue that is less than 40 million Turkish Lira which is roughly equals to 7 million United States Dollars (1TL= 0.17USD). This definition written in the Turkish law is used within Turkish borders to define MSMEs. After the candidateship of Turkey for being European Union member, some scholars in Turkey suggest this definition must be revisited and adjusted to EU standards (Müslümov, 2002: 5).

Table 2.1. Classification of MSMEs in Turkey

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Micro Enterprises</th>
<th>Small Enterprises</th>
<th>Medium Enterprises</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of Employee</td>
<td>&lt; 10</td>
<td>&lt; 50</td>
<td>&lt; 250</td>
</tr>
<tr>
<td>Annual Revenue</td>
<td>≤ 1 Million TL</td>
<td>≤ 8 Million TL</td>
<td>≤ 40 Million TL</td>
</tr>
<tr>
<td>Annual Balance Sheet</td>
<td>≤ 1 Million TL</td>
<td>≤ 8 Million TL</td>
<td>≤ 40 Million TL</td>
</tr>
</tbody>
</table>

Source: kobi.tobb.org.tr
As seen in the table 2.1 above MSMEs divided into three different categories called micro enterprises, small enterprises and medium enterprises.

- **Micro enterprises**: Defined as enterprises with less than ten employees and net annual revenue or annual balance sheet less than one million Turkish lira.
- **Small enterprises**: Defined as enterprises with less than fifty employees and net annual revenue or annual balance sheet less than ten million Turkish lira.
- **Medium enterprises**: Defined as enterprises with less than two hundred and fifty employees and net annual revenue or annual balance sheet less than forty million Turkish liras.

### Table 2.2. Classification of MSMEs in European Union

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Micro Enterprises</th>
<th>Small Enterprises</th>
<th>Medium Enterprises</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of Employee</td>
<td>&lt; 10</td>
<td>&lt; 50</td>
<td>&lt; 250</td>
</tr>
<tr>
<td>Annual Revenue</td>
<td>≤ 2 Million Euros</td>
<td>≤ 10 Million Euros</td>
<td>≤ 50 Million Euros</td>
</tr>
<tr>
<td>Annual Balance Sheet</td>
<td>≤ 2 Million Euros</td>
<td>≤ 10 Million Euros</td>
<td>≤ 44 Million Euros</td>
</tr>
</tbody>
</table>

Source: European Commission, 2005

If we look at the same definitions in EU standards on the table 2.2, we will see that some numbers are slightly different comparing to Turkish definition of MSMEs. As already mentioned in earlier sections, this difference is caused by differences in economical standards and development levels from country to country.

MSMEs holds a great importance in Turkish economy. The reason what makes MSMEs special and important is, their unique features comparing to large scale companies. In the MSME type of companies are free from the pressure of board members, shareholders and loan lenders this make decision making in this type of companies is freer in comparison to larger scale companies. Main reason behind this freedom is company owners rule their own companies and use their own resources to fund these companies. In the MSMES relation between employer, employee and supplier is also more personal (Küçük, 2005: 108-109).

Main features of MSMEs are shown below (Akgemci, 2001: 15).
• MSMEs can generate maximum output variety and amount with minimum investment,
• Employment can be increased with low amount investments,
• Because of their low scale and limited nature, MSMEs get less affected by economical fluctuations,
• Easy to adapt changes and variations of demand in the markets,
• Can provide supply when there is low amount demand in the market,
• There is low amount of hierarchy within MSMEs,
• Management of MSMEs has close ties with the employee and customer base,
• Less affected but regional changes as they adapt to environment they are built in,
• Helps with allocation of the wealth in the countries by supporting lower wealth groups,
• Labour is an important element of production,
• Using personal funds to finance the company,
• With low amount bureaucracy decision making process works faster,
• Most importantly, MSMEs can more easily adapt to changes in technology.

According to numbers from Turkish Statistics Foundation (TUIK) in the year of 2013 there were 3,529,541 registered entities were found in Turkey. Out of this amount, 3,524,331 of them were companies with less 250 employees. Only two out of thousands of these companies were found not eligible to fit in the revenue and balance sheet specification for MSMEs, which is not a significant amount, thus TUIK didn’t exclude them from this total amount. Also, on the definition of MSME in Turkish law, it also states that for government subsidies only employee amount can be used to define a MSME, for that reason this number can be used show amount of MSMEs in Turkey. According to these numbers and acceptations 99.9% of total companies can be defined as MSME in Turkey. Based on employee numbers, this total 99.9% MSMEs are consist of 93.6% micro enterprises, 5.4% of small enterprises and 0.9% of medium enterprises. This numbers indicates that majority of enterprises in Turkey can be classified as micro level enterprises.
MSME in Turkey perform in various different industries while some industries have larger population of MSMEs still there are many different industries can be found where MSMEs perform in Turkey.

These industries are listed below (SME 2015 – 2018 Action Plan by Ministry of Science, Industry and Technology of Turkey):

- Agriculture, Forestry and Fisheries,
- Mining and Quarrying,
- Manufacturing,
- Electricity, Gas, Steam and Air Conditioning Production and Distribution,
- Water Supply; Sewage, Waste Management and Improvement Activities,
- Construction,
- Wholesale and retail trade; Repair of Motorized Vehicles,
- Transport and Storage,
- Accommodations and Service Activities,
- Information and Communications,
- Finance and Insurance Activities,
- Real Estate Activities,
- Professional, Scientific and Technical Activities,
- Administrative and Support Service Activities,
- Training,
- Human Health and Social Work activities,
- Culture, Arts, Entertainment, Leisure and Sports,
- Other Service activities.
Figure 2.1. Allocation of Turkish MSMEs in Major Industries

Source: TUIK

As it can be seen in the figure 2.1. above allocation of MSMEs in Turkey according major industries defined as 35.2% in commerce, 12.5% in manufacturing, 0.9% in agriculture and 51.4% in other industries (TUIK). This numbers shows us that the biggest single industry preferred by Turkish MSMEs is commerce comparing to other major industries. Which signifies the importance of this research paper for Turkish MSMEs.

2.2. Relation Between MSMEs and International Trade in Turkey

As study showed in previous section 99.9% Turkish economy is consist of MSMEs. This signifies the role MSMEs’ role in international trade. If Turkey wants to improve the cross-border trade, first place to look and reform is MSMEs and their conditions. According to TUIK trade statistics from 2018, while MSMEs contributed to 55.38% of exports larger scale companies contributed 44.62%. This numbers clearly shows that even though 99.9% of companies in Turkey are MSMEs total export numbers are still equal 0.01% remaining large scale companies. On the exports side this gap is even more significant, while large scale companies did the 64% of total exports, MSMEs only did total 36%.
Table 2.3. 2018 Export and Import Numbers of Turkey

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of employees</th>
<th>Exports</th>
<th>Imports</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>B-E</td>
<td>G</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>Industry</td>
</tr>
<tr>
<td>2018</td>
<td>Total</td>
<td>167,917,921</td>
<td>56,551,530</td>
</tr>
<tr>
<td></td>
<td>1-9</td>
<td>33,665,540</td>
<td>8,860,020</td>
</tr>
<tr>
<td></td>
<td>10-49</td>
<td>32,194,116</td>
<td>8,602,671</td>
</tr>
<tr>
<td></td>
<td>50-249</td>
<td>27,727,959</td>
<td>17,149,903</td>
</tr>
<tr>
<td></td>
<td>250+</td>
<td>74,928,444</td>
<td>69,913,115</td>
</tr>
<tr>
<td></td>
<td>Unknown</td>
<td>421</td>
<td>21</td>
</tr>
</tbody>
</table>

Source: TUIK 2018 International Trade Report Turkey

As we can see from the export and import allocations according to employee numbers from the table 2.3, few larger scale companies are accounted for almost 50% of total international trade of Turkey. For Turkey to get a better spot in global trade race, Turkey must improve conditions for MSMEs and by doing that increase their contribution to international trade. For this reason, Turkey’s focus has been on MSMEs to improve their current state, Turkish government has addressed these issues several times with actions plans created by Turkish Ministry Science, Manufacturing and Technology. On the last action plan publish by same ministry also highlighted that new policies are needed to foster competitiveness of MSMES, help them became more international, create easy financing for MSMEs and encourage research and development for MSMEs.

2.3. Issues effecting MSMEs’ International Trade Participation in Turkey

As the study has shown in previous section vast majority of companies in Turkey consist of MSMEs, however their contribution international trade in Turkey is significantly low comparing larger scale companies. This chapter will focus on factors effecting MSMEs in Turkey in terms of international trade participation. As the world trade constantly progressing, there are new problems and new advancements occurring constantly both for MSMEs and larger scale enterprises. However limited resources of MSMEs makes them much more vulnerable to these changes. For these very reason governments constantly try to create new policies to protect the current state and later improve the participations of MSMEs (Öztürk, 2007: 35).
In this next section study will deep dive on various factors that are affecting MSMEs participation on international trade. Later at the end of this section we will mark the factors which can be improved with technological advancements.

2.3.1. Financing Issues

Capital related disparity of MSMEs are common to see in both in developing countries and developed countries. Problems caused by capital related issues may result in having newer problems for financing from outside. It is very common in financing that companies use their company capital as a trust fund to receive and extra outside financing. If companies cannot guarantee certain amount of capital for financing, they will be faced with financing issues (Yatbaz, 2013: 30). According to WTO statistics roughly 50% of financing applications from MSMEs are rejected in comparison to 7% ratio in multinational corporations. If we consider that around 80% of world trade is directly or indirectly supported by financing this problem becomes a very dire one and MSMEs have a big disadvantage comparing to larger scale entities. In Turkey situation is not very different as well, the financing is the major factor that is affecting the MSMEs participation in international trade.

Main reasons Turkish MSMEs facing this financing problem can be show as below (Ege, 2007: 199-207):

- Not sufficient starting capital in the MSMEs, later cause problems with short- and long-term loan needs of the company. As the banks and other lender organizations usually check the cash flow and financial tables, many MSMEs is facing this very similar issue.
- Another issue with financing is high interest rates and high cost of loans. Later on, these two factors create the risks for companies to pay their loans back.
- There are very limited number of financing subsidies for MSMEs and this is another reason for financing problems.
- Failed collection of the account receivables can be stated as another reason for MSMEs’ financing issues.
- Because of the risk of cost, many MSMEs cannot perform domestic and international direct sales to increase their financing capabilities.

High inflation rates are one of the major reasons why MSMEs face starting capital issues. Also, one big factor that is causing problems is using the financing resources not effectively and this
is happening because, most of the MSEMs lack the financial departments with professional financial support (Kutlu, vd., 2007:192).

Banks prefer to work with few larger scale companies rather than working with many small entities, and this makes financing even more difficult for MSMEs. If some of the MSMEs successfully manage to get a loan from a bank, later on these companies has to pay back a large amount of interest as their loan deals are relatively smaller comparing to bigger scale companies, which makes it very difficult for MSMEs to pay back their loans. (Aras, 2001: 61).

One another issue that causing financing difficulties, is lack of alternative financing methods. MSMEs must pay most of their costs generated by company with their own resources, mainly from their own capitals. Any type of spending that company makes reduces the amount capital company holds. This self-financing and using bank loans weakens the company profiles and because of damaged MSME profile, they won’t be able to find other alternative financing opportunities (Kutlu, vd., 2007: 192). MSMEs lack of different sources to asses and find out about credit risks of different financing tools, which increases the cost of financing for MSMES and this becomes trouble for them to complete different oversea trade transactions.

2.3.2. Production Related Issues

Main reason MSMEs faces issues related to production, because of lack of technological development. Due to lack of technological advancement, MSMEs cannot find suitable production methods or fail to develop these production methods for their companies. Thus, MSMEs usually purchase know-how from other sources which eventually increases their production costs (Özgen, vd., 1998: 27).

The main issues MSMEs in Turkey face can be listed as following (Uygun, vd., 2014: 8-10):

- Low need of raw materials and resources of MSMEs causes issues related to supply side.
- Lack of infrastructure, economic fluctuations, financial difficulties and lack of technology and similar issues many MSMEs face economic lost. Specially lack of technology makes MSMEs dependent on outside sources.
- As advanced technological production lines are highly costly, makes it very difficult to obtain these systems for MSMEs who are having issues with financing.
• If MSMEs somehow sort out the problems with financing for advanced production lines, later on they face the problems with finding trained personal to operate these production lines which turns into big human resources problem.

• As MSMEs lack corporate structure and organization structure many of the reach and development initiatives face difficulties.

• Lack of certifications and professionalism creates inefficient production lines and problems in after production.

• Rather than using professionals to make decision making on technological investments, in MSMEs this decision making comes from company owners and this can cause production problems.

• When determining the future demand for production, rather than using certain formulas and methods available, MSMEs tend use forecasts and past records and this causes production planning problems.

• Lack of information cause MSMEs face difficulties finding quality production sources.

Fluctuations happening in currency exchange also increases the cost of imported materials for production, this situation makes it difficult for MSMEs who are relying on imported production materials. Lastly, MSMEs cannot take the advantage of economic of scale when in come to production in masses and this puts them disadvantageous position comparing larger scale companies.

2.3.3. Marketing Related Issues

Marketing is an activity which performed to provide better service and product transfer from suppliers to consumers. Marketing consist of stages like developing new ideas, creation of product and services, determining price levels and ensuring distribution. MSMEs because of their nature have smaller market share in their industries. One of the main reasons behind MSMEs have difficulties with marketing research is they do not have qualified employee who has sufficient understanding of marketing. Thus, MSMEs face lots of issues to enter new markets outside of their current market ecosystem. If MSMEs want to open up to markets outside of their country they will be facing high costs. As a conclusion MSMEs have difficulties performing any export activities as
a result of high costs and incapability of understanding complex market conditions. (Müftüoğlu, 2002: 137).

The list of main issues MSMEs face can be listed as:

- Regarding developing new product, MSMEs lack new ideas and also fail on executing new ideas,
- Rise of imitation products in the market,
- The rapid changing habit of consumers,
- Difficulty of presenting the differences of their products,
- Lack of marketing departments in the companies along with lack qualified staff to fill these departments,
- Lack of vision in marketing,
- Misuse of marketing tools or lack of use of these tools,
- Low amount of research regarding marketing activities,
- Limited market capacity and being dependent on domestic markets,
- Must follow the rules set by the larger scale companies whose determining the demand and supply for their markets.

One of the major issues MSMEs fail to participate in cross border trade is language. To execute a successful marketing campaign in abroad marketing staff must have good level of language proficiency and good analytical understanding. Lastly one of the reasons why MSMEs hesitate to participate in international trade and perform export and import activities is, rapid rise of global trade all around the work and rapid technological advancement happening in this area.

2.3.4. Issues related to Market Entry

Growth and development of a country is directly related to its export levels for that reason exports are high valuable activities for countries. Thus, having enough products to export and gaining all possible benefits from export is very vital for each country. With the rise of global trade and globalization trend, countries use different trading improvement strategies to encourage both MSMEs and other companies to do more exports and enter more markets. However, during this
improvement process, companies face quality related problems and standardization problems in order to enter new markets (Akgemci, 2001: 30).

The reason behind MSMEs having issues entering new markets are not only related to support and consultancy they receive. Aside from these issues, lack of information in international markets, harsher competition conditions, difficulties reaching potential buyer and sellers, difficulties catching expected standards and high cost related to international trade causes MSMEs to have difficulties entering new markets. Specially complicated custom procedures for each country and tariffs make it even harder for MSMEs to penetrate new markets.

2.3.5. Research and Development Related Issues

MSMEs cannot perform economical self-evaluations of their business decisions and for this reason they can’t come up with action plans like large scale companies. Factors such as globalization, changing economical situations, international competition, constantly changing consumer preferences limit the capabilities of MSMEs. Among MSMEs only very limited number of medium scale companies are able to conduct research and development activities, follow technological advancements, conduct scientific research and perform implementation and development activities.

With more companies from Turkey performing in global markets in recent years, create the realization for importance of advancement. MSMEs who failed follow and adept new advancements cannot be effective in the international markets and miss the improvement opportunities, thus have limited performance in international trade (Müftüoğlu, 1991: 199)

Even though Turkey has large amount of reach paper published and patent right registered, per person ratio for research and development is still very low. Also, collaboration between universities and companies is performed in very low numbers. Most importantly R&D spending of Turkey is still too low comparing to develop countries. Due to high tax rates paid by MSMEs in Turkey, many of the policies places to solve this problem becomes ineffective (Çalınmar, vd., 2007: 447).

The main issues MSMEs face in research and development activities can be stated as:
• Limited resource and financing,
• High risk related to innovation in general,
• Lack of know-how for technology related topics,
• High cost of procurement of technology,
• Lack of qualified personal,
• Not enough dedicated time for innovation,
• Being old minded,
• Difficulties being faced when marketing new products,
• Demand pressure of consumers over MSMEs,
• Unclarity of consumer needs.

2.3.6. Presentation Issues

MSMEs are incapable of presenting their own products and services. Main reason behind this is, they do not have enough information about advertising, exhibition participation, and creating one to one connection with buyers. Another reason for poor presentation is, not giving the needed importance on presentation due the fear of cost increase. Aside from these parts many MSMEs are incapable of doing advertising themselves and this becomes an issue for their presentation.

2.3.7. Other Issues

• Many MSMEs lack the right resources and skills to find and select sales prospects, consumer preferences and new business opportunities in third markets, which is one of the major barriers preventing them from engaging in international trade or expanding their participation (WTO).
• Non-tariff barriers, such as standards, technical regulations and conformity assessment procedures,
• Administrative costs with the trade cost are much higher for MSMEs competing to larger scale companies,
• Logistics costs and logistical hurdles,
• Transparency issues in procurement procedures,
• Currency exchange fluctuation,
• Turkish youth losing interest in manufacturing industry,
• Lack of consultation for investment opportunities,
• Unfair competitive markets created but non-registered entities,

3. UNDERSTANDING BLOCKCHAIN TECHNOLOGY
Before we deep dive in solutions offered by blockchain technology it is essential to establish a
good understanding of this revolutionary technology. In the following parts research will focus on
detailing features of blockchain technology and why it is different from other similar solutions.
After we understand blockchain technology and it is features fully, we will visit issues blockchain
technology is experiencing to change the future. Lastly, once we will look into ways blockchain
technology can be implemented to solved different better understand the limits of the blockchain
technology we will look into solution offered to solve problems we face in international trade by
blockchain. From the table below study shows that this technology has caught the interest of many
different parties in several industries and reached a record investment of 4.152 billion in 2018.

Table 3.1 Equity funding and investment of blockchain start-up companies worldwide from 2012
to 2019 (in million U.S. dollars)

<table>
<thead>
<tr>
<th>Year</th>
<th>Investment in million U.S. dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>1</td>
</tr>
<tr>
<td>2013</td>
<td>93</td>
</tr>
<tr>
<td>2014</td>
<td>357</td>
</tr>
<tr>
<td>2015</td>
<td>524</td>
</tr>
<tr>
<td>2016</td>
<td>550</td>
</tr>
<tr>
<td>2017</td>
<td>1,053</td>
</tr>
<tr>
<td>2018</td>
<td>4,152</td>
</tr>
<tr>
<td>1H 2019</td>
<td>783</td>
</tr>
</tbody>
</table>

Source(s): CB Insights; ID 621207

3.1. The definition and Features of the Blockchain Technology
Humans used first writing to tell stories and keep records of yearly transaction and production
value. Ledgers to keep records had been our trusted tool trough out the history for mankind.
Ledgers we will be talking are used for keeping track of records of transactions or property. Ledgers in old fashion, were managed centrally by authorities such as banks and governments. These authorities were responsible for maintaining the records of the ledger. They were also responsible with ensuring transparency in regard to how the ledgers function and data stored on these ledgers.

However, rise of a new technology allowed ledgers to have other options then just being centralized. With his recent advancements now, ledgers can be both decentralized and they can be distributed in between different data collection facilities. Which enables data to be shared with multiple end points. These end points could be at different geographic locations and could be different institutions. Our first introduction this ground-breaking technology was with digital currency, Bitcoin. This new digital currency was based on a distributed ledger technology. This new distributed ledger system allows Bitcoin to be maintained and controlled collectively by different servers which are called nodes.

To be able to enter a new to date this distributed ledger system, each data needs to go through a process called consensus mechanism, this allows members of the network to determine whether this entered data are legit or not. Simply it a way for member of this network to verify every entry. During this process consensus process the method cryptography is being used, to cypher and uncypher data entries to keep the user anonymous and secure.

These three elements we mentioned above which are distributed ledgers, consensus mechanism to validate and use of cryptography to keep it secure and anonymous are the key characteristics of distributed ledger technologies which we can be shortened as DLT. We can see the difference of the distributed ledgers comparing to traditional ledgers on the figure 3.1.

Furthermore, the technology which is covered in this study blockchain is also belongs to this DLT family. Blockchain also uses cryptography and some other algorithms to verify different transactions within the system. Later on, records of these transactions are bundled together and called blocks. After, these blocks generated by bundling transaction data are linked with a chain. Together they give the name of this technology ‘block’ and ‘chain’. Using the consensus
mechanism any update on a ledger is shared with all the network using the chain structure, and all the people on this network is able to see the copy of all the ledger any time they want.

![Figure 3.1. Comparison of Traditional and Distributed Ledgers](source)

Source: WTO “Can Blockchain Revolutionize International Trade?”, 2018

This tamper-proof, decentralized and distributed nature of blockchain creates the trust for this technology. Furthermore, used cryptographic techniques make sit near inalterable. In the old school databases where the data is stored centrally and administrated by a single authority, on the other hand blockchain is based on peer-to-peer that is not administrated by a single authority. Thanks to consensus protocol within the blockchain different parties can collaborate without need of trust for each other and without relying on a single party to administrate the network. Furthermore, it is important to mention that each entry to this network has a timestamp which further improves the security of data entry aspect and make transactions easily traceable. Blockchain technology also includes added feature which is called smart contracts. These are computer software that are capable of self-execution when certain conditions and variables are met. This process often used to both automate systems and it helps reducing the cost. It is safety say that with given features of blockchain it is a system which much more reliable any type of attacks from outside comparing older databases, however it is still not perfectly secure system as there can be flows which are not yet discovered.
There are different types of blockchains, many might think is blockchain is single type technology however there are different types of it. These other kinds differentiate from each other based on their features and limitation of each. Blockchains can be in three different types, first it can be public this form of blockchain is the closest form which close to being 100% decentralized; secondly it can be private or managed by group of companies which is called consortium this form is less decentralized as it has an authority that is managing the chain. Private chains can be managed by either consortiums or by a single private entity, in the case of consortium blockchain will less centralized as there is no single entity to manage the chain, rather group of companies working together.

Another way to classify blockchains is chains there are permissionless and permissioned. Permissionless blockchain means, that blockchain will be accessible by everyone and good example for this permissionless blockchain is Bitcoin. In the case of permissioned blockchains, the word permissioned means this chain is restricted. On permissioned blockchains users can be restricted to read and write on the blockchain. Most common form of blockchain in the field of international trade related solutions is permissioned consortium chains.

### 3.2. Challenges Blockchain Technology Facing
Blockchain technology may seem as an interesting opportunity for many different industries, but first it has to overcome some challenges before it can be used to reduce cost, make processes more
efficient, traceable and secure for these industries (Boucher, 2017). Until solutions are found for these challenges, we won’t be able to see blockchain technology used widely. As can seen on the table regulatory concerns are the major barrier ahead of the blockchain. As for every new product the trust for this technology comes second as challenge to blockchain technology. Lastly interoperability making different networks communicate each other is third biggest challenge ahead of blockchain.

**Table 3.2 Biggest barriers for blockchain technology adoption worldwide as of 2018**

![Bar Chart](chart.png)

Source: PwC; ID 920785

However, as for every technology there are steps and there is a curve of development. Internet that we use in our everyday life didn’t just come to our lives in one day, it had completed its journey and now we are able to use it in every spot possible.
3.2.1. Scalability Challenge

For every invention, scalability holds an important importance. As the word itself describes without this invention being able to scale up, there are no ways for this invention to be accepted widely. For blockchain main issue with scalability problem rises from its predetermined block size. For example, limit for transaction per second of Bitcoin is theoretically 4,000, however currently Bitcoin network is able process 7 transactions per second. When we compare this number with how much transactions VISA can process in one second which is 2,000 per second on average with a peak of 56,000 transactions, we can clearly see the limitation of the scale (Croman et al., 2016). This issue is more significant for public blockchains as they are targeting a larger group of people and have no restrictions, on the other hand for the consortium permissioned blockchains this is not a big issue as they are able to restrict users who are able to read and write on chain, or scale it up for their future needs. Thus, consortium blockchains which have good potential for international trade has no scalability issue. They can simply use less expensive protocols to verify transactions and for that reason they can be more scalable. For example, The Hyperledger Fabric, which is a operation system which is distribute for permissioned blockchains. This system can process 3,500 transactions in one second (Androulaki et al., 2018). In order to target this issues, new way of algorithms is being developed, in these new algorithms they abandon the concept of blocks and there for new algorithms are much quicker which make them more scalable comparing old algorithm.

3.2.2. Energy Consumption Related Challenges

Many scholars and different economist are talking about the energy consumption levels of blockchain technology. In the case of permissionless blockchains this issue more significant as the block and user numbers are not limited with any number. and energy consumption of the process. Main debate is around can benefits that blockchain technology brings will come with huge energy related consequences. As the mining process consumes lots of energy on the chains this is raising concern for many.

3.2.3. Security Related Challenges

Another potential long-term issue that blockchains may face in the future is security related challenges. As study mentioned earlier that blockchains are more secure and harder to crack
through due to their decentralized and distributed nature along with use of cryptography. However, still that doesn’t mean that they are completely immune to any sort of security problems. As technology advances each and every year there can be possible threats to blockchain technology in the future, specially developments in quantum computing may present some challenges for blockchain (WTO). Due this reason scholars and scientists are actively looking for new algorithms which are more resilient to quantum computing.

3.2.4. Interoperability Based Challenges
Another challenge that blockchain is facing is the issue of interoperability. This problem exists in both technical levels of blockchain and as well as the semantics level. At the current day there are various platforms are being developed and these all platforms are using different interface and also different algorithms. These platforms which are developed without a connection with each other, thus any of these platforms fail to communicate with each other. This problem is called “digital island problem” as each platforms act as separate islands those are not connected to each other. Blockchain community is working for possible solutions but as for today there are no ultimate solutions this very issue.
Another level in interoperability problems is about the data semantics. As different problems receive or send data to each other, these problems need to identify and understand these incoming data. The current state blockchains face a issue here, data semantics tend to change platform to platform and they face difficulty to share data between platforms to create more efficient systems. These problems are currently addressed by different organizations, International Chamber of Commerce (ICC), International Organization for Standardization (ISO), United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT) and the World Customs Organization (WCO) created study groups to standardize the blockchain development and tackle interoperability problem.

3.2.5. Legal Challenges
As with all new inventions, blockchain also has legal challenges as there are no regulatory framework for this brand-new technology. For blockchain to widely spread blockchain requires a regulatory framework. This framework will validate and clarifies and transactions on blockchain and make them applicable to law and regulations. Most important part which needs to get
emphasize is the legal situation with transactions happening on blockchains. Crucial legislation which is needed is, a legislation that can verify and recognize the transactions, signature and documents on blockchain transactions. United Nation Commission on International Trade Law (UNCITRAL) have created a pilot law on electronics transferable records. Upon this development currently different countries are working on new legislations. Governments are planning to use these new legislations on development to recognize transactions of blockchains.

The legislation issues are a bit more problematic in the case of permissionless blockchains. However, on the permissions blockchains there can be technical solutions which will make jurisdictions and liabilities applicable. There are other potential problems with legal status, which is privacy of the data. As the nature of the blockchain is distributed this privacy is hard to ensure. Also, there is a right called to be forgotten also causes some issues with legal space as the data recorded on blockchains are there permanently and this contradicts with the blockchains principles. Some parties think that both blockchain principles and right to be forgotten principle at the core carry the same goal which giving individuial more control over their personal information.

With the codifications of law commonly used smart contracts will be making their way into our lives legally. With the developments in the global legal identifications these two improvements will help solve issues related to blockchain technology. During this transformation period, understanding legal implications is crucial to develop collective solutions to tackle legal concerns. If these legal and standardization issues can be targeted and solved, blockchain can make a huge impact on international trade.

3.2.6. Other Challenges

As study pointed out few of the challenges in details there are more challenges exist for blockchain with time and investment these challenges will be overtaken however it’s important to mention them to have clear understanding of challenges.

You can see below to check some of the other challenges that are worth mentioning:

- Need for significant investment and expertise for wide implementation,
- Willingness of all parties to participate in this technology,
- Some companies won’t be willing to share their information with network,
- Cross border jurisdiction issues in the case of it is implemented for international trade.
3.3. Blockchain’s Implementation on International Trade
Since blockchain technology became famous with Bitcoin, there have been numerous discussions on where this new technology can be implemented. As for today blockchain technology has been used for various cases as can be seen below. We will be able to see that many of these mentioned industries directly or indirectly involved with international trade operations.

Table 3.3 Blockchain technology use cases in organizations worldwide as of April 2019*

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Share of Respondents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data validation</td>
<td>43%</td>
</tr>
<tr>
<td>Identity protection</td>
<td>40%</td>
</tr>
<tr>
<td>Payments</td>
<td>39%</td>
</tr>
<tr>
<td>Track and trace</td>
<td>37%</td>
</tr>
<tr>
<td>Certification</td>
<td>36%</td>
</tr>
<tr>
<td>Access to IP</td>
<td>32%</td>
</tr>
<tr>
<td>Record reconciliation</td>
<td>30%</td>
</tr>
<tr>
<td>Asset transfer</td>
<td>30%</td>
</tr>
<tr>
<td>Revenue sharing</td>
<td>25%</td>
</tr>
<tr>
<td>Asset-backed tokens</td>
<td>24%</td>
</tr>
<tr>
<td>Tokenized equity</td>
<td>23%</td>
</tr>
<tr>
<td>Tokenized asset</td>
<td>22%</td>
</tr>
<tr>
<td>Time stamping</td>
<td>21%</td>
</tr>
<tr>
<td>Custody</td>
<td>20%</td>
</tr>
<tr>
<td>Not sure / other</td>
<td>19%</td>
</tr>
<tr>
<td>None</td>
<td>16%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100%</td>
</tr>
</tbody>
</table>

Source(s): Deloitte; ID 878732

There are various parts where blockchain technology can improve international trade, as shown on the table above. Trade financing, logistics, certifications, transportation, insurance, distribution, customs procedures, intellectual property rights and government procurements etc are major parts can be improved. The homogenous, decentralized and resistant nature of blockchain took attention of many private parties and governments in international trade. Many different consortiums have been created to test pilot project to find perfect formula for the international trade. While technology itself open very interesting opportunities where it can make processes more efficient and less costly, it is still “the solution” for every problem international trade face. Parties who are interested in this technology must evaluate cost and benefit structure to determine whether this technology can help them or not. Early pilot projects and early implementations shows that with blockchain implementation, international trade can become less paper heavy. At the moment there are many different parts of international which are heavily relying on paper heavy works. On the figure 3.3, you can see the current trade documentation process which also relying on paper heavy.
procedures. On the figure 3.4. you will be able to see four main procedures involved with international trade process.

![Typical Trade Documentation Process](image)

**Figure 3.3.** Typical Trade Documentation Process

Source: Accenture

Everyone at this stage are asking the same question. Can blockchain really have the potential to change the international trade? In this part of study, we will deep dive into parts where blockchain technology can come on to play for international trade. Below we can see the four main processes involved with international trade.
3.3.1. Trade Finance Implementations

One of the first parts where blockchain technology can be implemented to improve the current system is trade financing. As a result of BIS Research, we can see on the table x.x that finance industry has been the focus of 60% of the all blockchain initiatives. According to this study it is safe to say that most of the blockchain solutions were trying to solve different finance problems which of these include the trade finance related topics.
Only small part of trade transactions is paid in cash before receiving their goods, most the buyers prefer to pay when the good are properly delivered. According to WTO research 80% trade is financed by some sort of financing (WTO, 2016b). Within this field blockchain can help automate trade finance processes. Particularly with in the cross-border trade widely used letter of credits can be automated by using this technology. It can also help to make supply chain related financing easier. Current trade financing model is extremely paper heavy and high costs related to it along with complicated procedures makes them hard to reach for companies. Aside from that making a trade transaction which involves multiple parties make the system further complicated. Due the fraud and risk involved with in, open account transactions often not preferred by exporters. Using the blockchain technology parties can create digitalized processes along with know-your costumer KYC processes to help supply chain financing. On this figure 3.5. below we can see how blockchain payment solution implementation can simplify exporter and importer relations. The whole complex model of trade finance from broader perspective can be see on the figure 3.6.
There are a great number of banks working with different parties like fiancé start-ups and technology firms to create potential pilot applications of this technology. There are already numerous pilot projects created by these parties and their projects looks promising for the future. However, before banks and other companies to further investigate the matter there are certain regulatory needs for the blockchain technology to be used in a wider scale.
Figure 3.6. Traditional Trade Finance Process

Within trade financing another part blockchain can improve is reducing the risk of duplicate invoices. When this is achieved it will be easier for MSMEs to access to capital.

For example, in 2016 few banks and Infocomm Development Authority of Singapore reported that they have been working on a prototype of blockchain which will simplify letter of credit transaction between exporters, importers and their banks (WTO).

3.3.2. Custom Procedure Implementations
Blockchain technology can help with border procedures and their administrations. With smart contracts and blockchain technology countries can create national single windows where all the stakeholders can submit their necessary documentation and other required information to complete the custom procedures. Which will make custom procedures more efficient for all parties. As well as transparent nature of blockchain will make procedures much fair for everyone. Countries will
be able to generate better trade data thanks to this new more secure system. Some countries already took action and try to venture with this technology. Korea Customs Service is preparing to launch a pilot project. This pilot project will be powered by blockchain technology and it will be more efficient custom clearance platform by the end of 2018.

We need to keep in mind that, custom procedures are also one the main reason behind the trade costs. According to WTO research tariffs are around 9 % on average in 2013(WTP, 2015a) trade costs can go up to 219% tariff in developing nations. Most of these accumulated trade costs are related to paperwork needed and number of agencies involved in border procedures. Aside from customs related agencies there are many other outside players responsible for health, safety etc. who are involved with custom procedures.

3.3.3. Transportation and Logistics Implementations
This industry has many opportunities for blockchain technology to be implemented. The reason for this industry to have many opportunities is there are many players are involved with the transportation and logistics procedures which makes these procedures more complicated and more paper heavy. Many parties within this industry looking for possible blockchain solutions to gather all parties involved in one platform from supply chain, banks to custom authorities. One of the most recent application of blockchain was by a tech start-up called Modum, they use blockchain to monitor temperature of pharmaceutical shipments which will be later used by the Swiss Post.

3.3.4. B2G and G2G Processes Implementations
The real challenge for blockchain is to make government to government (G2G) and business to government (B2G) processes more efficient. This big step will require blockchain technology solve standardization and interoperability issues at the technical level. However, the efforts of making blockchain more fit for this process is not enough, parties who will be involved must be willing to create regulatory framework. If both results can be achieved, then paperless trade will be closer to these procedures. By looking figure 3.7. we can better understand 4 different complex G2G procedures.
3.3.5. Supply Chain Implementations

When it comes to supply chain, blockchain also have a lot to offer in this field. Using blockchain technology product can be registered and certified using same system directly starting from production. Thanks to same system tracking goods along to supply chain will be easy for all the parties involved with these products. Each and every step involved with supply side will be verified and stored and shared in real time all along the chain. With the use of blockchain solution within supply chain, many paper-based processes can be streamlined and became paperless. There are already working application for this implementation, famous retailer Carrefour has been chicken production in France using blockchain technology and they aim to expand this production by the end of 2018. Also, in 2017, IBM and shipping company Maersk announced a blockchain solution to improve documentation management in supply chains.
3.3.6. Security and Risk Related Implementations
Due to decentralised structure of blockchains, this new system built with blockchain will be more secure. Thanks to immutable record and verified transaction ledgers, supply chain related security issue will be minimized. Thus, there will be less risk of fraud and error during trade processes. Furthermore, customs use these same systems to assess risk related to their works. Other benefit of blockchain bases system would be transparency along the chain due recorded ledger on the chain. This will help stakeholder with proof of authenticity, provenance and the standards of the goods and services that will be provided along the chain.

3.3.7. Intellectual Property (IP) Rights Implementations
IP is becoming more important part of international trade. As innovation is the key to stay n top of competition, protecting these ideas has a significant value for creators and innovators. In today’s world many products from medicine to high tech goods, they all require high amounts of investment and research. If these companies can’t protect their product rights, they will lose their profitability. There is an important role that blockchain can play in protection of IP rights. Using the technology purchaser can check and verify the legitimate ownership. They will also able to track the ownership history of the goods and services that they are buying. In the current old model doesn’t require registration determining the real owner can be difficult. Thus, authors and other creators are struggling to getting paid for their hard work. Using the blockchain solutions creations can be registered and tracked from the creations to meeting the end customers with real time data.

3.3.8. Certification and Licensing Related Implementations
When talk about cross border trade countries had to ensure products that they are receiving are above certain criteria and standards. To ensure this quality there have been certificates created and products expected to obtain these certificates prove their quality. There are many forms of certificates such as: sanitary, phytosanitary, origin, conformity etc. These certificates are delivered by trusted authorities. Companies during the trade process requested to obtain these certificates by reaching these authorities and prove their standards. Using the blockchain technology these certificates can be obtained recorded on a single database where all other parties requiring these certificates can see. Which will make the processes much quicker and cost efficient as the medium authorities won’t be needed.
Also, licenses required in order to perform trade activities can be stored on blockchain based systems. By doing so companies can easily store and share their permits and licenses with other parties and these other parties would be able to check the validity of these licenses within the same system. Furthermore, use of smart contracts can help tracking licenses with time period limit.

4. HYPOTHESIS CRAFTING AND TESTING

In this section of study, we will create hypothesis regarding how blockchain technology can improve participation rate of Turkish MSMEs in international trade. In order to do this, we have already identified the major issues that Turkish MSMEs are facing. Using these problems as a start point will try to test relevancy of blockchain solution to these issues. On the first section there will be hypothesis crafting and the explanation of why this hypothesis was created. Later, on the following section study will test these hypotheses whether they are true or not and explain reasons behind using different data sources. Using the results at the end of study we will make a conclusion and using the induction model we will make suggestions to other developing countries using Turkey as a role model.

4.1. Hypothesis Crafting

In this section there are hypothesis crafted using Turkish MSMEs issues in regard to international trade. Study will explain why these hypotheses were selected after each of them.

4.1.1. Hypotheses Crafting Related to Trade Finance

- “Blockchain technology can help MSMEs in Turkey to have easy access to capital.”: As starting capital is main issue for most of the MSMEs to later obtain loans, starting capital issue is critical for MSMEs. It is the first domino stone at the beginning.

- “Blockchain solutions can reduce the cost of loans along with risk for MSMEs.”: When we look at the reason why MSMEs in Turkey have difficulties to obtain financing one of the major reasons behind is the cost related to payment of this credits. That makes this hypothesis another important milestone for MSMEs.

- “Using blockchain based payment solutions will eliminate loses of Turkish MSMEs caused by currency exchange fluctuations.”: MSMEs in Turkey are highly affected by the currency
changes in Turkey with thanks to this technology they can try to use new payment methods based on blockchain technology such as digital currencies.

4.1.2. Hypotheses Related to Custom Procedures

- “With Blockchain technology, digitalized custom processes can make market entry easy for Turkish MMSEs.”: One of the main issues of Turkish MSMEs about entering new markets can be made easier with blockchain technology.
- “Turkish MSMEs will be able to reduce the trade cost related to custom procedures.”: Simplification and digitalization of custom procedures will reduce cost of trade for Turkish MSMEs which is major reason why they are avoiding performing export actions.

4.1.3. Hypothesis Related to Transportation and Logistics

- “With the help of blockchain solution, MSMEs in Turkey can reduce their transportation and logistics costs.”: With handling all transportation and logistics related procedures on one chain, will eliminate costs related to different parties involved with the process, thus it will reduce cost of trade for Turkish MSMEs.
- “MSMEs in Turkey can better track and ensure on time deliveries using the blockchain solution.”: Being able to track the goods will help Turkish MSMEs with safety and reduce the risks related to international transportation.

4.1.4. Hypotheses Related to Supply Chain

- “MSMEs can use blockchain supply chain solutions to find quality production resources or raw materials.”: In order to production to start MSMEs are indeed of resources and raw materials, having low quality inputs during the production will result with low quality unintended outputs.
- “Using blockchain technology Turkish MSMEs can ensure better quality and certified products in international markets.”: With the help of blockchain technology Turkish MSMEs can better track their production and ensure better quality and solve the quality issues their facing with their production lines.
4.1.5. Hypotheses Related to Security and Risk

- “Using new product stamping and smart contract features of blockchain Turkish MSMEs will reduce their risk related to trade.”: With the help of smart contracts Turkish MSMEs will be to tackle collection of receivables problem and data offered on the products will reduce the risk of procuring faulty products.

- “Turkish MSMEs will be able to identify reliable sales prospects and avoid fraud with blockchain solution.”: With every company being registered on a single database, this solution can help Turkish MSMEs’ information gathering problem and can reduce their risk.

4.1.6. Hypotheses Related to Intellectual Property (IP) Rights

- “Protection of IP rights with blockchain technology, will encourage Turkish MSMEs to perform more research and development activities.”: IP rights solution offered by blockchain can be a direct solution issue with regarding research and development problem Turkish MSMEs are facing.

- “Turkish government will be able to provide better subsidies to for MSMEs who are investing in new technologies.”: With the new technology implemented government will be able to spot owners or creators of new products and can support these initiatives better.

4.1.7. Hypothesis Related to Certification and Licensing

- “Turkish MSMEs will have less complication on the certification and proof of certifications in international markets using new blockchain technologies.”: With blockchain technology certificates will be stored on a single chain. This will allow MSMEs to use single system to obtain and after obtaining prove the certification for other parties.

- “Blockchain solution will reduce the fraud and risk related to licensing so on MSMEs will face less risk.”: With new blockchain system using the smart contracts time sensitive licenses will be automatically terminate, this will help other parties detect and get precautions against expired trade licenses.
4.2. HYPOTHESES TESTING
In this section of the study, some of the hypotheses created in previous section will be tested with available data related to topics using Turkey as a case study. Some of these hypotheses can be true, and some other can be wrong in short run. In the case both results studies will try to explanation reason behind.

4.2.1. Hypotheses Testing Related to Trade Finance
We all heard about digital currencies and their controversy. This hypothesis about pa procedures occurring during trade actions.
“Using blockchain based payment solutions will eliminate loses of Turkish MSMEs caused by currency exchange fluctuations.”
Blockchain was first introduced to public with their use in digital currencies such as Bitcoin. These solutions decentralize classical bank centred models. And digital currency holder can store this amount on their hot or cold wallets and can liquidate it any time they wish. In the case of Turkish MSMEs using these digital currencies actually can benefit them a lot. If we look at the TL exchange rate over USD in past year on the figure 4.1, we will be able to see the sharp changes and unstable nature of TL.
By using digital currency, Turkish MSMEs might avoid changes of the exchange rate. This hypothesis is true. However, we need to keep in mind that, digital currency payments will be only possible if both parties involved in trade accept these currencies.

4.2.2. Hypotheses Related to Custom Procedures

“Turkish MSMEs will be able to reduce the trade cost related to custom procedures.”

Above we can see one of the biggest problems Turkish MSMEs face in international trade mentioned. Custom procedures are as their nature complicate and involves lots of different parties. Digitalizing this process will reduce the parties who are involved with this process and so on this will reduce the trade costs for MSMEs. Considering OECD calculations, 1% saving in trade related transaction can yield a worldwide benefit of US$43 Billion (OECD 2003), not only Turkey buy all the countries involved with trade will hugely benefit from this reduction of cost.
4.2.3. Hypothesis Testing Related to Transportation and Logistics

“MSMEs in Turkey can track and ensure on time deliveries with more efficient transportation using the blockchain solution.”

When we talk about cross border transaction, tracking goods and knowing exactly where they are located is an important information which can be requested by your clients. You will be hearing questions like “where’s my load? What’s going on with it? When it will cross the border?” with the current system it is really hard to track your goods unless you pay for expensive solutions offered by few companies. Also, it is important mention that there are always capacity problems with freights, usually one direction is always preferred more comparing to other and these create inefficiency in cross border trade. With internet of thing support blockchain technology can track your goods from start in the factory to all the way to end costumer and all this information can be shared with all the partied in real time.

4.2.4. Hypotheses Testing Related to Supply Chain

“Using blockchain technology Turkish MSMEs can ensure better quality and certified products in international markets.”:

Indeed, being able to track to source of product all the way to it is production opens up lots of new windows for both users of the products and manufactures. As our community gets more health conscious and pays more importance to quality of product necessity of the origin checks became more vital for many different product lines. Using single public chain solution Turkish MSMEs can better prove and became more competitive in the international markets. We can see the sample illustration of this system on figure 4.2.
4.2.5. Hypotheses Testing Related to Security and Risk

“Turkish MSMEs will be able identify reliable sales prospects and avoid fraud with blockchain solution.”

When all the companies involved in trade are somehow registered on single public chain. Other companies will be able to easily identify reliable and trustworthy companies. This will help solve the major fraud issues happening in international trade. Also, this technology can help Turkish MSMEs with information collection problem that Turkish MSMEs are facing. Using this public chain Turkish MSMEs can detect and target better sales prospects. Even in theory this system sounds promising, achieving such database will be a challenging work for blockchain pioneers, thus we will see no short-term effects on Turkish MSMEs.

4.2.6. Hypotheses Testing Related to Intellectual Property (IP) Rights

First hypothesis we need to test is:

“Protection of IP rights with blockchain technology, will encourage Turkish MSMEs to perform more research and development activities.”.
These arguments states that if IP rights problems are resolved in international market, this will be an encouraging point for Turkish MSMEs to invest more in research and development practices. First party study needs to investigate is whether blockchain technology can really help solve challenges on IP rights. Later, study will investigate whether these improvements using blockchain can help Turkish MSMEs to perform more research and development practices.

Topic of intellectual property rights is very bureaucratic system which involves many parties. It includes patents, trademarks and copyrights which all use centralized system that are sensitive date. With the use of blockchain this system can be easier to verify and recorded on ledger which is public which carries all the information regarding trademark and patent information. If this universal decentralized ledger can be established, this new system would not be limited by geographic boundaries and it will be truly global. However, in order to achieve a global single public chain, pioneers need to solve the issue related different law and regulations on patent and trademark registration in each country.

Table 4.1: Financial and non-financial corporations’ expenditure on R&D by size group and type of cost, 2018

<table>
<thead>
<tr>
<th>Type of cost</th>
<th>Current cost</th>
<th>Capital cost</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sub-total</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>current cost</td>
<td>capital cost</td>
<td></td>
</tr>
<tr>
<td>Toplam-Total</td>
<td>23 289 367 294</td>
<td>21 260 147 363</td>
<td>2 029 219 931</td>
</tr>
<tr>
<td>1-9</td>
<td>1 151 772 873</td>
<td>1 032 945 284</td>
<td>118 827 589</td>
</tr>
<tr>
<td>10-49</td>
<td>2 923 352 910</td>
<td>2 628 627 242</td>
<td>294 725 668</td>
</tr>
<tr>
<td>50-249</td>
<td>3 875 143 506</td>
<td>3 510 347 624</td>
<td>364 795 882</td>
</tr>
<tr>
<td>250+</td>
<td>15 339 098 005</td>
<td>14 088 227 213</td>
<td>1 250 870 792</td>
</tr>
</tbody>
</table>

Source: TUIK Research Development 2018
According to data from TUIK, we can clearly see that the share of MSMEs spending for research development is only 34% of total R&D spending. This signifies the necessity of support for R&D in Turkey, considering 99.9% of all companies are MSMEs in Turkey. With the global blockchain solution, MSMEs might be able to see the value of R&D activities as they will be able to hold their patent rights worldwide, also they won’t have the fear of losing their innovation rights to imitators in outside markets.

5. CONCLUSION AND SUGGESTIONS
On the date of September 18th, 2019, Turkish Minister of Manufacturing and Technology Mr. Varank, revealed Turkey’s technology movement for 2023. During this big reveal, the minister mentioned the importance of the blockchain solution and added that Turkey will focus on using blockchain technology to increase efficiency and reduce costs. The minister also added that 2020 will be the year for blockchain investments for the ministry. During the same reveal, the minister mentioned that Turkey will be developing an infrastructure for blockchain and will be supporting different blockchain projects with government grants. Lastly, the minister added that they will be developing an ecosystem where they can test and try pilot blockchain projects.

From this big reveal, it is safe to say that Turkey and the Turkish government are aware of blockchain solutions and their potential. During this reveal, most of these statements stand as green light for blockchain initiatives in Turkey. This update further signifies the importance of this study for Turkish MSMEs and blockchain application in Turkey.

As study clearly shows, there is great alignment between issues Turkish MSMEs are facing in international trade and potential solutions offered to international trade by blockchain technology. Even though blockchain technology is on a very early stage, it is no doubt that rapid growth and revolution of industries are around the corner. With the mass acceptance and usage of blockchain technology, Turkish MSMEs will be able to solve their issues related to international trade. Considering 99.9% of companies in Turkey consist of MSMEs and small improvement for them will have huge impact on Turkish economy. With the blockchain solution, Turkish MSMEs will be able to solve issues in the fields of trade financing, production and supply chain, research and
development, marketing activities and market entry problems. However, it is important keep mind blockchain technology as it is not the ultimate solution to all MSMEs’ problems. Issues related the management and vision needs to be tackled with better education and better training of future leaders. With this remind it is an important understanding that blockchain is not solution for all the problems and it will not happen in short run. As the old habits don’t change easily old traditional methods will also take time to replace.

Finally using the induction method, study can suggest blockchain solution for other developing countries which are mostly consist of MSMEs just like Turkey to follow same steps to improve international trade patrition of MSMEs. It is important to note that not all countries and government will be thinking like Turkey and accept this new technology right away, however by time with the more living proof of this solution more and more countries should be adopting this new system. At the end blockchain technology will be a solution which is going to be used globally and change international trade once and for all.
BIBLIOGRAPHY


Acknowledgments

With the invention of blockchain and new era has been started for human history, I believe this technology will help foster many different industries. The technology itself is not perfect yet however, with the amount work put by scholars, innovators it will not take long before it is massively adopted. And I believe with this adoption there will be a fairer environment for all the stakeholders of the world. Turkey in this case will be one of the developing countries who will benefit a lot from this technology. With a welcome policy towards blockchain, I see Turkey as one of the pioneer countries who will first adopt blockchain technology and became a role model for other nations.

I would like to thank my supervisor Professor Cheng Ming for his constant support and constructive feedback to make this thesis possible. I would like to also thanks all other professors and my friends under the roof Shanghai University for their continues supports.

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Dedication

Not mentioned.

Conflicts of Interest

There are no conflicts to declare.