

Covid-19: Decentralized Food Supply Chain Management

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ABSTRACT

The distribution of ingredients within the food supply chain has become the foremost necessary issue raised within the current COVID-19 program. Market activities became global and sophisticated since the Covid-19 pandemic has become more widespread, these problems have resulted during high demand for food supplies, especially for affected communities, so blockchain technology advocated to extend the distribution's traceability during a decentralized and transparent manner. This method realizes the effective delivery of food supply chains in real-time, including physical conditions and geographical positions, on the premise of protecting privacy and security. It concluded interconnectivity from decentralization and transparency advantages for the COVID-19 program, both communities, and organizations. This paper introduces new inventories to the model and methodology of chain management techniques, supported general supply chain modeling with suppliers, logistics, and distributors, as a matter of optimization of distribution in several general principles and assumptions that support writing workshops. The point of this paper is to spot food supply chain management to share availability information in improving decentralized distribution.

Keywords: Blockchain technology, COVID-19, Decentralized, Supply Chain,

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INTRODUCTION

In December 2019, the spread of the outbreak of infection to the present point was Coronavirus Disease or COVID-19 [1], resulting in many countries laid low with the epidemic. Hence, the overall public health crisis in food nutrition takes under consideration to decreased. The political, cultural, and socio-economic impacts of this pandemic can jointly cause significant changes in human society like increased remote-jobs, localization of worldwide supply chains, and increased political polarization. Investigations are ongoing to understand higher the transmissibility, severity, and other features associated with COVID-19, but there are indications that the spread of person to person occurs exponentially. The global organization (UN) warns that the coronavirus pandemic (COVID-19) could threaten the worldwide food supply chain discontinue because various countries impose restrictions on lockdown. The UN report [2] explains that a protracted pandemic crisis can disrupt the food supply chain even though at present, food on supermarket shelves continues to be available. Still, a

prolonged pandemic crisis can make food supply chains chaotic so that many sophisticated networks involving farmers, agricultural products, processing plants, shipping, retailers, etc. In its report, the world organization stated that restrictions on the shipping and aviation industries had complicated the method of food production and international freight transportation. This condition makes countries with minimal alternative food sources have high socio-economic risks. The world organization World Food Safety Committee (CFS) [3] says that increasing instability in world food supplies will affect the most deprived groups of individuals. Private companies and organizations have drawn up immediate action to deal with the threat of worldwide food supply. They also need to be sent open letters to world leaders. "Governments, businesses, civil society, and international institutions have to take immediate and coordinated action to stop an epidemic from turning into a world food and humanitarian crisis," writes scientists, politicians, and personal companies like Nestle and Unilever in their first letter [4].

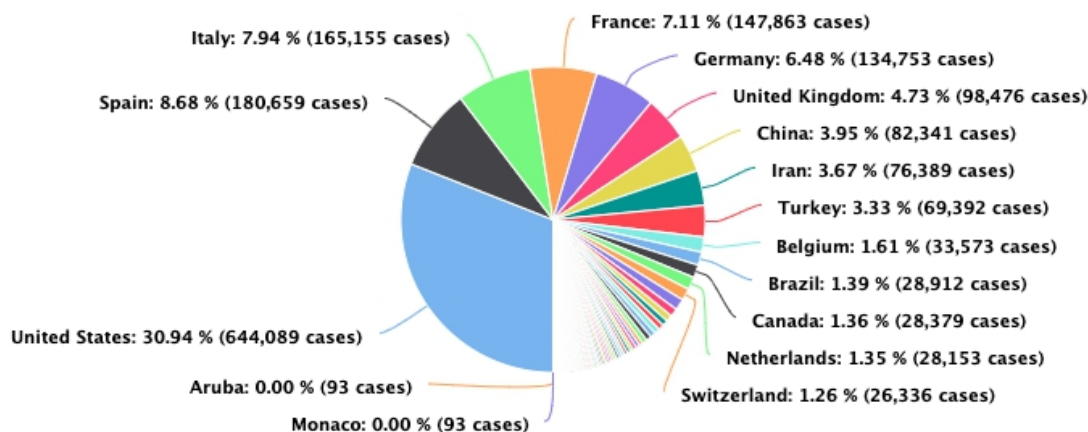


Figure 1. Distribution of Cases of Infected Countries

Source: Worldometers[5]

On April 16, 2020, 82,294 people were infected with the worst case of 644,089 within us. The amount of infected cases is probably going to occur still, so prevention and control of the disease have become the foremost urgent task globally, and also the Government has invested plenty of labor and material resources to regulate the epidemic. Observing people littered with COVID-19 requires plenty of human and material resources, places

an enormous burden on the prevention and control of this rapidly spreading disease, and is challenging to realize scientific management. If modern information network technology is applied, the process of food supply chain management will be simple and also significantly increased so that secondary damage to food supply chain management will be reduced [6].

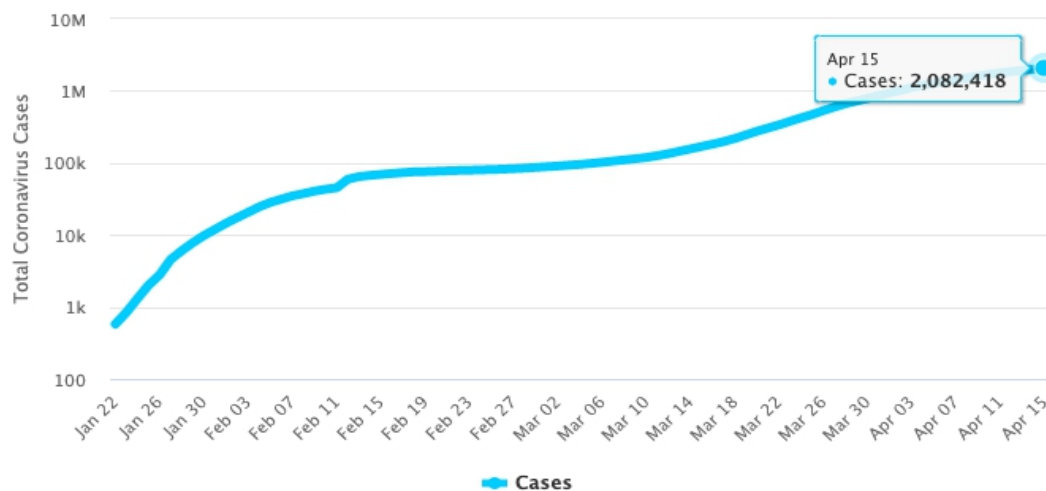


Figure 2. Total Cases of Entire Countries
Source: Worldometers[7]

The number of people infected with the coronavirus (COVID-19) continued to grow until Wednesday, April 15, 2020, reaching 2 million people infected. Agreeing to Worldometers, the precise number of cases is 2,082,418, with 134,560 passings and 510,122 people recovering. According to the basic theory of controlling infectious diseases, eliminating the source of infection, cutting off transmission lines, and protecting vulnerable people are the most useful measurements. This article provides an understanding of the distribution system in the food supply chain that deploys using models and methodologies to record physical conditions and geographical locations so that information sharing guarantees in increasing decentralization and real-time. For example, when a rapid rise in body temperature occurs, medical personnel will do so promptly. Also, alarms are triggered when they leave the quarantine area, and Track personnel location to prevent further infection. Blockchain innovation is commonly seen as the first pivotal mechanical patterns influencing the disintermediation of food supply chain management. The birth of blockchain technology that contains a general-purpose as possible to be ready to provide change for agencies in increasing trust when correlated with one another [8]. The potential benefits of blockchain in handling COVID-19 outbreaks like around increasing technical to social up to economic phases [9] and promises are high [10]. Adoption of Blockchain within the provision chain and logistics is also a feature of the country [11] as a kind of positive impact that will provide changes in food supply chain management to the socio-economy and context must be reconsidered. So far, some literature references have centered on the standard of innovation in overcoming the challenges of food supply chain management with technology against using the blockchain for peer-to-peer network operations [12]. At the same time, the terminated project shows that at the organizational level, most difficulties found. Of late,

blockchain modernity has to been presented as an innovation to back expanded item information dispersion [13] inside the food supply chain. The sophistication of the blockchain gaining reliable control over complex, heterogeneous, and dynamic food supply chains is required to satisfy increasing consumer demand about product quality and safety, which has led to many food scandals [14]. The matter that's substantially caused by the implications of disasters could also be the scandal of limitations in knowing the geographical conditions of the food supply chain [15].

The constellation within the current food supply chain and COVID-19 are that the blockchain interfacing indeed the uttermost parts of the accessibility chain organize. It was coordinating all organization administration, counting forms and exchanges, into a central arrangement. Providers and buyers can handle the blockchain innovation demonstrate more viably. With impressive versatility and mechanical brilliance, blockchain can alter the entire scope of supply chain management. To substantially improve the flexibility to trace food agencies, agencies must exchange information about the quality assurance that's sufficiently detail between each other. Blockchain has advocated as a technology for creating credentials significantly, and therefore the latest ideas are proposed to beat the challenges of food supply chains decentralized by blockchain technology [16], [17]. This idea must be driven by technology, with a spotlight on the technical feasibility dimension. Within the article, it's necessary to use a unique start line and focus that's a place on monitoring investigations in handling COVID-19 outbreaks in food supply management that must be chain-linked by blockchain technology. During this research, decentralized monitoring defined as "social, technical obstacles to realizing a worldwide food distribution system."

Literature review

Some people have responded that blockchain technology could be a potential threat to the formal monopoly of food supply chain accreditation in organizations. Therefore, this paper outlines three challenges for

organizations to think about within the supply chain management approach to technology blockchain. Table 1. Food Supply Chain Management Against Blockchain Technology

No.	Supply Chain Management Approach	Description
2.1	The increasing need for food distribution during a pandemic is endemic	In the first sub discussion, it discusses an increase in needs and distribution so that it faces challenges that require extraordinary measures to ensure that nutritious food continues to be sent to individual stores and at the door of the consumer.
2.2	The concept and characteristics of traceability and food distribution systems	The second explains the framework of three things and the four characteristics of the blockchain for tracking food distribution.
2.3	Blockchain technology in handling COVID-19 outbreaks	The third describes four concepts which have a middle on the restrictions or constraints discussed within the current research references.

With these three discussions, is expected to provide interconnectivity so that they can benefit from reducing the number of cases caused by Coronavirus Disease 19 or COVID-19 and increasing and improving socio-economic conditions that have declined for the better.

Increased demand for food distribution during pandemic outbreaks

The increase in cases caused by COVID-19 has had an impact on the supply chain, and there are five priority

areas where the food supply chain is taking action to reduce risk. The COVID-19 pandemic will continue to spread, so some organizations have stepped up their subsidiarity efforts to provide essential items for consumers and to protect the health and well-being of people.

Table 2. Priority Areas for Food Supply Chains

Part	The scope of activities include
Product development	Design and involve suppliers in designing new products and conducting marketing research.
Provision	Select and evaluate supplier performance, make purchases of raw materials and components, foster and maintain relationships with suppliers, monitor supply risk.
Control & Planning	Planning for capacity, demand and production and supply, demand forecasting.
Operation / Production	Production execution, internal control.
Distribution / Shipping	Conveyance organizes arranging, finding, and keeping up connections with shipping benefit companies, observing benefit levels at each dissemination center.

A critical method of reasoning for this thought is to concentrate on decreasing squander and optimizing esteem inside the pertinent supply chain. This way, supply chain management characterized since the administration of shifted exercises inside the system of getting crude materials, taken after by change exercises in arranging that it gets to be an item inside the method, at that point gets to be a wrapped-up item. It proceeds with shipping to customers through a dispersion framework. Attain this; food supply chains face challenges that need extraordinary measures to confirm that nutritious food continues to be delivered to individual stores and at the doorstep of consumers. To cut back short-term impacts, supply chain leaders create transparency and build quick response capabilities. Ideally, quality assurance demands the complete availability of every ingredient within the final product, so this requirement leads to the necessity for quality exchange of data between all performing artists to fulfill the expanding customer request for security, quality, and maintainability [18]. Customer affectability was primarily activated by a few food outrages inside the 1990s and

2000s, which moreover come about in more tightly national and worldwide directions and stricter nourishment in security and inside the control. Despite progressively exacting endeavors to oversee food control measures required in adapting with the COVID-19 flare-up, the administrative system between nations and districts remains broadly diverse, and nourishment questions of security and emergency circumstances still happen habitually at the around the world level [19]. For occurrence, a inquire about the keywords "nourishment dispersion" on the enormous New York Times site [20] creates articles per month on this subject. Food dissemination episodes and emergency circumstances not as it brought controllers into activity, but to make expanded shopper mindfulness of the accessibility chain. Food dissemination is presently considered an imperative angle in guaranteeing nourishment dispersion and items quality and expanding shopper certainty and fulfillment.

Characteristics and ideas of Food Distribution Systems

The system concept explains that Industry 5.0 continues to be developing towards a more efficient state in terms of cost, time, and labor for production and services in handling COVID-19. The graceful output is not any longer supported supply and distributors, but both integrated with a powerful and efficient logistics system. Therefore,

defining this term as a place to begin for this research is first to clarify the concept and affirm the same view on this matter. Conveyance benchmarks have a lion's share practice in depicting capabilities and taking after the essential characteristics of an item from the starting (counting fixings) at the time of COVID-19 flare-up to the extreme preparing step inside the whole supply chain.

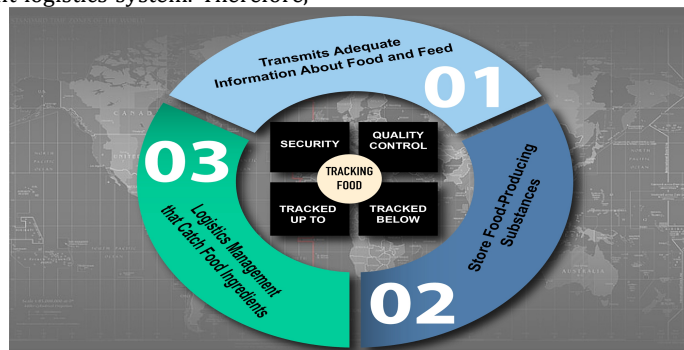


Figure 3. Blockchain for tracking food distribution
Source: Food Control[21]

Decentralization in food distribution is an element of logistics management that stores, captures, and transmits satisfactory data so that it supports, beings, food substances, or food-producing substances. The smallest stage in the food supply chain to COVID-19 in regulating goods that valued for security and intuitive control is follow up and at any time if needed, that requires patients and individuals to take care of decentralization. Determining tracking food distribution as part of a coordinating administration emphasizes the exact truth that offers chain activities including methods for obtaining raw materials and their components such as warehousing, manufacturing, documentation, order management, distribution, transportation, communication, internal control, and food safety and guarantees quality capabilities whose efficiency and effectiveness are highly additive to logistical operations.

Blockchain technology in handling COVID-19 outbreaks

Blockchain is taken into account a technology that has the potential to own an effect on society while its potential remains largely unexplored. The same as the event of the web as a replacement platform for presidency and company activities, the hope is that Blockchain Technology will experience developments that will result in unexplored possibilities further as handling COVID-19 outbreaks for the food supply chain. This supply chain process is one in each of the fields [22], [23] and specifically the adoption of product tracking and tracking of food supply chains, increased efficiency of procedures at the govt, decentralized distribution and delivery of digital products, and food security guarantees by implementing a and guaranteeing food safety by applying to a food supply tracking system in sequence. It gets a handle on the potential of this innovation for nourishment following frameworks, and it's moreover imperative to keep in mind of its specialized imperatives and restrictions. The consequent concepts are techniques on the imperatives or restrictions examined inside the current investigate writing.

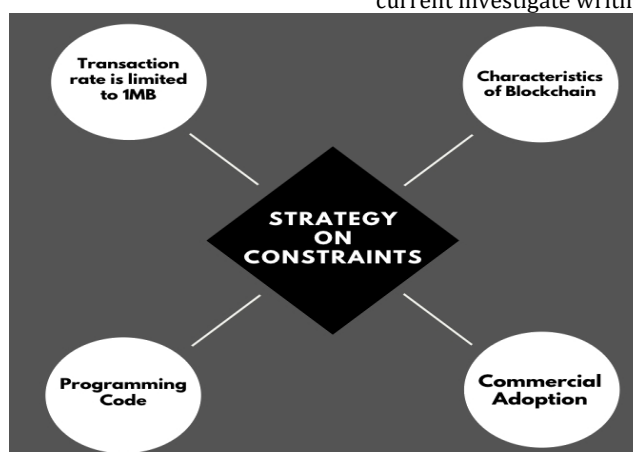


Figure 4. Blockchain Strategy Constraints on the Food Supply Chain

First, having a limited transaction rate because blocking the initial blockchain supported the system without permission will limit the block capacity to a maximum of 1 MB and processing speed of up to 7 transactions per second. The impossibility of closing data processing of numerous exchanges in a brief period of your time amid the accessibility chain prepare, alternative implementations of blockchain technology are

significantly improved at the transaction level [24], [25]. Additionally, the employment of a system permits with a maximized agreement demonstrate will altogether increment time interim. Second, exchanges that are put away on a blockchain are unchanging and irreversible, so this implies that the blockchain grows with each transaction and grows into big. It is often, in essence, a controversy in an unauthorized system that will be

accessed by a variety of users out of control, so each block within the previous transaction must save. So this fact is a smaller amount relevant within the context of supply chain distribution systems with a limited number of COVID-19 cases. Third, receiving blockchain innovation as a blurb inside the supply chain depends on the sum of security of delicate data inside the case of COVID-19, indeed wagering on the amount of protection of client namelessness. As an example, a scenario may define where not all blockchain users must be known by everyone, but just for a limited number of users. Additionally, to enable effective traceability in handling COVID-19 as a distribution of food supply chain management, certain information within the blockchain is confidential. It requires assurance against unauthorized get to and spillage. Whereas the original blockchain plan included nearly no usefulness to shield touchy news, commercial stages presently recognize this prerequisite & permit the chance to control get to the dispatch on the blockchain [26]. Fourth, the blockchain depends on the programming code and so the correct application of innovation. Such assortments of the program are in threat of system that is ineffectively creating or kept up that has programmers - looking for pick up - openings for abuse of such vulnerabilities. Be that as it may, due to handling direct inside the accessibility chain handle, the assurance of the blockchain usage will play a noteworthy part in the selection of the blockchain inside the accessibility chain space. However, the event trend consistent with Rahardja (2019) is to form more transparency at the source and sort of innovation towards consumers who need the next level of traceability [27]. Within the conclusion, the individual petition required to see a way to settle the matter, which closes up in unanswered questions, whether the contract that's actualized alone is de facto an astute thought. At last, appropriation of a more significant blockchain requires a design that bolsters over one supply chain handle and where performing artists can fulfill diverse parts. A provider doesn't need to go up against an exceptional blockchain design from various clients. It may cause fracture and a high level of complexity in adapting with several blockchains. Standardization required towards a blockchain stage that bolsters distinctive consortium supply chain forms.

METHOD

There's no, by and large, concurred conceptual or hypothetical system for the conclusion and utilized of traceability inside the nourishment supply chain. Moreover, the display information base on the applying of blockchain inside the supply chain by and large, and in utilizing this innovation for supply chain innovation particularly, is constrained. In this manner, by using related work, one can get it the boundary conditions of blockchain inside the supply chain. Daniel Tse, et al. [28] explained that as a reasonable means for product quality management and safety and control, many countries and regions have researched, developed, and operated systems traceability. During this paper, Blockchain technology employed to unravel the agricultural food supply chain on traceability issues, to address food questions of safety further, and to demonstrate the link in each supply chain within the implementation process detail. Aiming at national market conditions analysis of China and China, a collection of theoretical methods accustomed adapt to the present Chinese situation to form the provision of agricultural product management

chains more efficient and reliable, additionally because of the quality and safety of agricultural products. Henry M. Kim and Marek Laskowski [29] said that adopting the net of Things and, therefore, the latest blockchain technology would have better supply chain resources. Interest in blockchain, because many cases use their favorite blockchain to be ready to source tracking. Then it becomes fascinated by applying ontology because there has been some work done on the origin of information, traceability, and food origin using ontology. During this paper, make a reason why ontology can contribute to blockchain design. During this case, by analyzing the ontology that some representatives can trace and translate to smart contracts that run resource footprints and uphold traceability imperatives on the Ethereum blockchain stage. Sara Saberi et al. [30] clarified that blockchain innovation as a digital record of changes that disseminated to ensure alignment, traceability, and security appeared guarantees, thereby reducing the number of world supply chains on administration problems. Amid this paper, blockchain innovation and savvy contracts inspected with basic potential entreaties for supply chain administration. A portion of this necessary examination is how blockchain, a possibly troublesome innovation that, at the beginning of its advancement, can overcome numerous potential impediments. Dinh C. Nguyen, et al. [31] inside the paper clarified that sudden upheavals and thus the uncontrolled spread of COVID-19 circular the world appeared the limitations of the show healthcare framework that thoroughly addresses open wellbeing crises. In such a setting, imaginative innovations like blockchain and computing (AI) have developed as promising arrangements to combat the coronavirus scourge. On the one hand, blockchain can combat a harmful infection by enacting new location of flare-ups, ensuring client security, and guaranteeing reliable restorative supply chains amid such inconsistencies. Jyoti Koirala, et al. [32] explained that the Nobel CoronaVirus Outbreak (COVID-19) from Wuhan had isolated several populations from populations that accustomed do activities. It's critical to get a handle on the part of the govt., Trade Houses, and Advancement Accomplices in understanding viability in readiness and reaction to genuine. Amid this inquire about draw clinical ability, field involvement to spot needs and crevices, and make suggestions for compelling preparedness and response. Overall this paper draws a major scientific construction in managing the COVID-19 outbreak combined with the sophistication of blockchain technology and several other studies that are present and in line with this paper is that the literature which appears that the employment of blockchain requires an honest understanding of the matter of food supply chain management within the outbreak of COVID-19 and therefore the precise definition of the destinations to be accomplished so as to cut back mortality and COVID-19 cases. Following uncritically modernizing isn't an accurate idea, although now, it's necessary to begin out exploring where the potential of this modern innovation lies inside the method of handling itself. Therefore this paper will analyze the boundary conditions within the process of decentralized food supply chain management to possess an outsized positive impact, thereby reducing the case of COVID-19.

RESULTS AND DISCUSSION

Case Study Description

The subject of examination for this investigation five distinctive food supply chain forms on COVID-19. The

choice of the four supply chain forms predicated on item differing qualities (from standard to personalized items), the strategy begins from generation to little clusters, which influence the necessities that come from controllers and evaluated to have distinctive boundary conditions. Amid this way, boundary conditions speaking to different unique circumstances are planning to be distinguished. Isolating the provider can effectively reduce the danger of forced interference with fabrication offices, especially in normal territorial disasters. After COVID-19, which saw many food supply chain providers being severely affected, several foodstuff makers,

including food, sought to work with topographically dispersed providers. Obtaining raw materials from providers found in some areas may reduce the possibility of a shared national disaster that negatively impacts fabrication office providers. This table appears the be about the reenactment expecting the end of all non-essential generation exercises. This result is base on reenactment midpoints. (Unit: trillion rupiahs).

Table 3. Loss of Indonesia's added value due to social restrictions

	Burden of losses on Indonesia	Loss costs other than Indonesia
1 day	0,287	0,252
1 week	2.009	1.68
1 month	8.61	9.11
2 month	17.22	29.04
3 month	25.83	52.08

When Indonesia implemented social restrictions, the award, including the generation of Indonesians using fast, became almost zero. Because day after day, the age of segments that were not crucial for Indonesia evaluated at 287 trillion or approximately 19.08 billion US dollars. The misfortune of full generation coordinates in Indonesia because of its social restriction of 287 trillion rupiahs increased using the number of days in the middle of the

lock period. Table three shows the direct production losses in Indonesia for each case in the moment column and also the loss of production outside Indonesia due to the impact of proliferation through the supply chain in the third column.

Table 4. Geometric average load loss

Alpha (significance level)	5%	
	Burden of losses on Indonesia	Loss costs other than Indonesia
<i>Count</i>	5	5
<i>Mean</i>	10.79120	18.64840
<i>Mean LCL</i>	-2.52008	-9.11094
<i>Mean UCL</i>	24.10248	46.40774
<i>Variance</i>	114.92947	499.81597
<i>Standard Deviation</i>	10.72052	22.35656
<i>Mean Standard Error</i>	4.79436	9.99816
<i>Coefficient of Variation</i>	0.99345	1.19885
<i>Minimum</i>	0.28700	0.25200
<i>Maximum</i>	25.83000	52.80000
<i>Range</i>	25.54300	52.54800
<i>Median</i>	8.61000	9.11000
<i>Median Error</i>	2.68723	5.60396
<i>Percentile 25% (Q1)</i>	2.00900	1.68000
<i>Percentile 75% (Q3)</i>	17.22000	29.40000
<i>IQR</i>	15.21100	27.72000
<i>MAD (Median Absolute Deviation)</i>	0.00000	0.00000
<i>Coefficient of Dispersion (COD)</i>	0.94667	1.76220
<i>Mean Deviation</i>	8.58704	17.96128
<i>Second Moment</i>	91.94357	399.85278
<i>Third Moment</i>	364.04392	5,819.12646
<i>Fourth Moment</i>	14,200.93961	315,880.98961
<i>Sum</i>	53.95600	93.24200
<i>Sum Standard Error</i>	23.97180	49.99080
<i>Total Sum Squares</i>	1,041.96785	3,738.07800
<i>Adjusted Sum Squares</i>	459.71786	1,999.26389
<i>Geometric Mean</i>	4.66449	5.69432
<i>Harmonic Mean</i>	1.19189	1.05793
<i>Mode</i>	#N/A	#N/A
<i>Skewness</i>	0.41293	0.72779
<i>Skewness Standard Error</i>	0.70711	0.70711
<i>Kurtosis</i>	1.67986	1.97571
<i>Kurtosis Standard Error</i>	0.75000	0.75000
<i>Fisher Skewness</i>	0.61555	1.08493
<i>Fisher Kurtosis</i>	-1.28054	-0.09716

The results show that after Indonesia carried out social restrictions for handiest someday production losses outdoor Indonesia, even though no social restrictions had reached 252 trillion, 82% of manufacturing losses in

Indonesia. When the shutdown continues for one month, the indirect impact on other regions is twice as significant because the direct effect on Indonesia and the envisioned total lack of manufacturing are IDR 29.04 trillion.

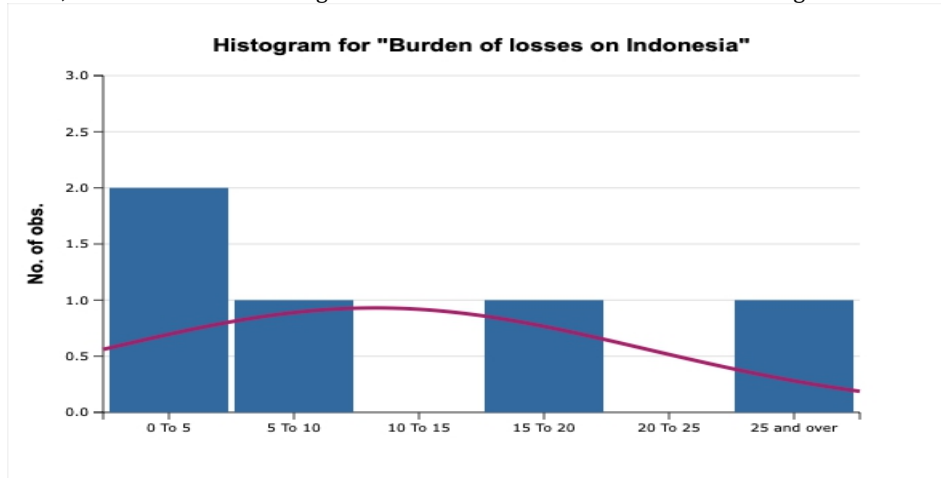


Figure 5. The dynamics of daily added value in Indonesia after social restrictions

Each row indicates a median of five simulations, assuming different stock sizes. The red line indicates the standard deviation and shows the simulation consequences with the assumption of stopping all non-essential production activities. Figure 5 suggests the temporal and geographical visualization of the lock simulation. Geometric averages show corporations whose production is much less than or same to 56% in their capacity, while harmonious proportions show businesses with more slight manufacturing cuts. The kurtosis column illustrates that a range of companies some distance from Indonesia are now not affected on the first day of closing. This visualization supports that effects do no longer right now spread geographically while social restrictions extended.

Blockchain Supply Chain Framework (BSCF)

The case in handling COVID-19 is analyzed supported by a framework consisting of 5 elements (see figure 5) so that the five aspects discussed within the methodology for monitoring the distribution of food supply chain management employing a blockchain.

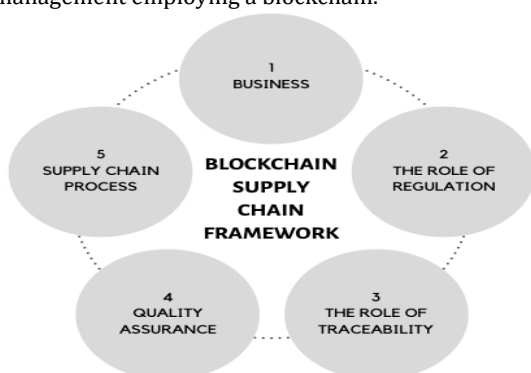


Figure 6. Blockchain Supply Chain Framework (BSCF)

BSCF #1 is that the blood supply chain of each business organization because it connects suppliers, producers, and end customers in a very network that's crucial for the creation and delivery of products and services. In managing the provision, the chain requires a process that's the method of designing, implementing, and controlling supply chain operations. The point of supply chain management is to align demand and provide as effectively and efficiently as possible. In position BSCF #5,

food supply chain management within the case of COVID-19 will be distributed in large quantities and is of a prime quality, so it requires a standardized production process and uses some other ingredients. It incorporates the exercises of a creating company with its providers (which can be producers, constructing agents, or both) and their associations to their providers (second-tier providers). Blockchain Supply Chain Framework (BSCF) in food supply chain management within the case of COVID-19 provides an interconnection of products for the B2C or Business to Customer showcase. It contains a range of high production processes. In stock, an outsized number of different materials utilized, so a crucial step inside the generation prepare is to prepare the bundling of the last item that contains various bundling forms and an assortment of extra providers and communities littered with the COVID-19 flare-up. Standard controls and insider controls, mostly valid plus quality and traceability measures, apply to certain items with necessary element tests, which suggest additional prerequisites for food to the community in regulating that they require vulnerability to their bodies and providing the shape of chains. Most of the delicate production processes specifically for COVID-19 service with standard internal control and traceability, specifically within the place and site littered with the case, can require partitioned certification. Extra administrative prerequisites may apply, for instance, within the case of materials for the medical sector like the handling of the Coronavirus so that this includes requirements regarding the flexibility to trace. The traceability requirements consistent with regulations aren't any different compared to other supply chain processes.

Blockchain system as distribution for food supply chains

Monitoring for decentralized distribution within the identified food supply chain supported the findings of the outline within the COVID-19 case. The allocation of the food supply chain allocated into five categories that accustomed to characterize instances (Table 2). Unusually, most of the boundary objects apply to all or any four supply chains. This finding wasn't anticipated at the beginning of the think about since supply chains contrasted altogether inside the commerce setting and characteristics of the accessibility chain. This finding is

frequently clarified since the qualification prerequisites are decided fundamentally by administrative guidelines that apply to all or any four food supply chains (Table 3).

The test statistic - F is the ratio of variance from both samples which has an F distribution under the null hypothesis.

$$F = \sigma_1^2 / \sigma_2^2$$

F CRITICAL VALUE (%) is a critical value of the distribution F.

One-sided critical value $F_{crit}(\alpha, N_1 - 1, N_2 - 1)$ and two-sided critical values $F_{crit}(\alpha/2, N_1 - 1, N_2 - 1)$

PART [LARGER / SMALL]

Many suggest using the sample with the greatest variance for the numerator.

$$F_{l/s} = \frac{\sigma_{Larger}^2}{\sigma_{Smaller}^2}, \sigma_{Larger}^2 > \sigma_{Smaller}^2$$

When using the sample with the most significant variance for the numerator F, it is always greater than one, and we can easily compare values $F_{l/s}$ which is observed with a two-sided Critical Value to determine whether the hypothesis value is zero (variance is the same: $\sigma_1^2 = \sigma_2^2$) must be accepted. If the observed $F_{l/s}$ value is higher than the two-tailed critical value, the null hypothesis rejected, and the conclusion is that the two variants are significantly different.

Table 5. Critical Value of supply chain qualifications

Descriptive Statistics		
	Burden of losses on Indonesia	Loss costs other than Indonesia
Sample size	5	5
Mean	10.79120	18.64840
Variance	114.92947	499.81597
Standard Deviation	10.072052	22.35656
Mean Standard Error	4.79436	9.99816
Ratio of variances Var[Burden of losses on Indonesia]/Var[Loss costs other than Indonesia]		
F	0.22994	
F Critical value (5%)	0.15654	
F Critical value (5%) 2-tailed	0.10412	
p-value 2-tailed (H1: F ≠ 1)	0.18357	H1 Rejected
p-value 1-tailed (H1: F > 1)	0.90821	H1 Rejected
p-value 1-tailed (H1: F < 1)	0.09179	H1 Rejected
F [larger/smaller]		
F	4.34889	
F Critical value (5%)	6.38823	
F Critical value (5%) 2-tailed	9.60453	
H0 F=1 (5%)?	Accepted	

The quality boundary question shows that the valid presumption that quality confirmation data could be a significant source for realizing track capability is essentially mostly affirmed. The following exercises regularly connected at the essential level without counting quality affirmation data. Quality data is significantly critical to see the scope of the standard-issue or withdrawal, and so the sum of items influenced - but to not track and follow fixings and items. Moreover, if internal control has chosen accurately, and thus the method has been outlined correctly, at that point, one may too state that internal control has the primary objective of dodging dispersion activities. Decentralized inside control must identify nourishment questions of security and maintain a strategic distance from these issues from spreading inside the supply chain. Quality confirmation data is imperative to create more straightforwardness among performing artists inside the supply chain and to customers approximately the beginning and quality of crude materials. This data - as long since it doesn't contain particular item details - isn't private and may well be included inside the common nourishment traceability framework. Finally, the traceability object asserts that providing chain characters on the screen must have an explicit statement about the granularity and standardization of information around tracing that regulates that the dispersion is going well. Assist upgrades in restricting the effect of an item review are frequently made when they look capability between players goes past one step back and one step to fulfill regulatory requirements. A complete survey of the

accessibility chain handle is required, which may well be given by blockchain innovation.

Food supply chain dissemination on data framework with Blockchain

The conveyance of the food supply chain that must be met by innovative arrangements recorded with the number of conditions steady with the case number in COVID-19. Generation in food supply chain administration requires to get to, and capacity of traceability data from different occasions inside the essential supply chain handle, and so underpins the needs of information framework innovation. Although this might show up as a straightforward and accomplished observing since it centers on inner supply chain forms. Amid this case, the movement of following back from area A to area B to area C. Amid the test, it entirely was found that a few manual activities still had to be applied, which was adequate exertion to communicate the information required inside the four hours ask period. Also, to mechanical capabilities, the data inside framework traceability must be consistent with information utilized for observing in personal forms. Quality assurance information and detailed distribution formations related to tracking control points require tracking system support for various forms of data and levels of detail. At the strategy level, the traceability control focuses frequently characterized, though, at the high level, they're reaching to appear current data approximately the date, time, and provider. In any case, checking on the agreed-upon or required level of detail, more information is necessary for certain group qualities

and characteristics to work out new group units. Modern blockchain innovation can meet the specialized necessities for checking that work as a food following system. Blockchain innovation permits get to for a few supply chain performing artists to communicate a portion of them to quality data and traceability that they require. Moreover, certain levels of interaction between performing artists when concluding look exercises regularly back. Data on the chosen blockchain engineering additionally the necessary level of secrecy, data are frequently expertly made unmistakable to other on-screen characters, whereas keeping up the confidentiality and judgment of this data at the same time. The critical perspective is deciding which data are attending to be shared and which cannot, so dividing an intemperate sum of data will conclusion within the dismissal of parties since they fear that their competitive qualities might harm, while deficient makes the framework futile. The kind and sum of information depend on the controls that are made sometime recently inside the method. The sort of blockchain allowed by the conventional open is that the foremost fitted design. This sort bolsters control of bunches of supply chain on-screen characters who are authorized to act at the same level reinforced dispersed arrangements without trustees as middle people or the ordinary open. Such design can give straightforwardness for supply chain accomplices, controllers, and clients and make more believe inside the nourishment supply chain inside the case of COVID-19. The activating consider this case is that the on-screen characters have distinctive relations with one another. In this manner, belief inside the secrecy of information inside the blockchain and access control could be an exceptionally imperative prerequisite. The address is who ought to begin such a blockchain? Start by supply chain accomplices can cause resistance. The govt might have this to cut back the number of cases on COVID-19, but it doesn't need to include inside the realization. The computer program company needed the nourishment supply chain information required to form this effective. More inquire about amid this heading is necessary.

Implication

Blockchain innovation could be a mechanical arrangement that permits for nourishment following COVID-19 dealing with cases. Be that as it may, this checking appears that executing a traceability system requires an organized and standardized supply chain between all variables (inner and outside). A viable critical suggestion of this investigation is that administration around blockchain sorts and information standardization must characterize some time recently the computerization preparation can start. It isn't innovation; that's an essential figure. However, standardizing forms of requiring organizational change and between actors performing in the supply chain can be a fundamental obstacle to achieving the amount that results in a full supply chain directly to the actors playing and ultimately also reducing the number of cases caused by COVID-19. Information administration must guarantee a uniform definition of information and specialist to create, get to, and change data. Information administration cannot be decided by accomplices from one Blockchain activity but requires understanding at different levels of the world, indeed, at the industry level. Something else, providers must follow to diverse interface guidelines that make blockchain innovation from a financially wasteful point of view. It has suggested the occasion of a consortium inside the restorative division backed by government

organizations to characterize and empower standardization. Whereas the standardization prepare may take a few a long time, this does not cruel that blockchain cannot utilize for nourishment following inside the interim. Expanded cases due to COVID-19 anticipated to actuate advance straightforwardness around the root of the fabric will cause distinctive arrangements inside the brief term, where blockchain is one in each of them. Whether or not decentralized checking is satisfied among a constrained number of supply chain on-screen characters, it's planning to the conclusion in expanded straightforwardness for customers and ideally a lessening in episodes due to straight.

CONCLUSIONS AND FURTHER RESEARCH

The proposed blockchain supply chain improved naturally due to efficiency, transparency, and low costs for handling COVID-19 cases. Plus, blockchain adds features such as immutability and transparency, which prohibit modifications to data fraud. Following the statistical data presented in this paper, it associated with the sophistication of decentralized and unlicensed blockchain technology that can provide real-time information to all or any party as an ecosystem of producers and consumers about the least safety status of food products. Blockchain technology shows that it is used in the supply chain for goods traffic and may be accustomed to creating transparency in product supply. Blockchain can be a suitable technology for handling COVID-19 cases because it might end up sharing more data among competing supply chain partners. Large amounts of data relating to administrative prerequisites in the supply chain so as a form of generation. They require critical organizational changes to back the total benefits of observing decentralized food supply chain dispersion. It incorporates following and dissemination usefulness, i.e., what shapes of information shared and who has got to which information are vital questions. The shortage of standardization of ace information and interfacing limits the degree of mechanization, so the complexity lies inside the arrangement between interfacing and measures utilized by different on-screen characters inside the supply chain. A plan has initiated for future implementation, so study the models proposed during this paper to form it simpler and more accurate, so it employed in handling coronavirus cases. This paper is also considering the constraints of this work and trying to cut back it. We also conceive to use machine learning concepts like existing models to form models more reliable and accurate so that they will use them. Finally, interpret the results obtained from considering the COVID-19 case and comparing it with theoretical expectations.

REFERENCES

1. Sohrabi, C., Alsafi, Z., O'Neill, N., Khan, M., Kerwan, A., Al-Jabir, A., ... Agha, R. (2020, April 1). World Health Organization declares global emergency: A review of the 2019 novel coronavirus (COVID-19). *International Journal of Surgery*, Vol. 76, pp. 71-76. <https://doi.org/10.1016/j.ijsu.2020.02.034>
2. PBB: Wabah Corona Berpotensi Ancam Pasokan Pangan Global. (n.d.). Retrieved April 22, 2020, from <https://www.ajnn.net/news/pbb-wabah-corona-berpotensi-ancam-pasokan-pangan-global/index.html>

3. PBB: COVID-19 Ancam Pasokan Pangan Global - Fokus Jabar Portal Berita Jawa Barat. (n.d.). Retrieved April 22, 2020, from <https://fokusjabar.co.id/2020/04/11/pbb-covid-19-ancam-pasokan-pangan/>
4. Leaderless, lacking and late: a global plan to fight coronavirus is desperately needed | Opinion | The Guardian. (n.d.). Retrieved April 22, 2020, from <https://www.theguardian.com/world/2020/apr/11/leaderless-lacking-and-late-a-global-plan-to-fight-coronavirus-is-desperately-needed>
5. Coronavirus Graphs: Worldwide Cases and Deaths - Worldometer. (n.d.). Retrieved April 22, 2020, from <https://www.worldometers.info/coronavirus/world-wide-graphs/>
6. Ulfah, M. (2017). RISIKO RANTAI PASOK GULA RAFINASI DALAM PERSPEKTIF SISTEM TRACEABILITY. In *ejournal.itn.ac.id*. Retrieved from <https://ejournal.itn.ac.id/index.php/seniati/article/download/1842/1591>
7. Yli-Huumo, J., Ko, D., Choi, S., Park, S., & Smolander, K. (2016). Where is current research on Blockchain technology? - A systematic review. *PLoS ONE*, 11(10). <https://doi.org/10.1371/journal.pone.0163477>
8. Sudaryono, U. Rahardja, Q. Aini, Y. Isma Graha, and N. Lutfiani, "Validity of Test Instruments," J. Phys. Conf. Ser., vol. 1364, no. 1, 2019, doi: 10.1088/1742-6596/1364/1/012050.
9. Hughes, L., Dwivedi, Y., Misra, S., ... N. R.-I. J. of, & 2019, undefined. (n.d.). Blockchain research, practice and policy: Applications, benefits, limitations, emerging research themes and research agenda. *Elsevier*. Retrieved from <https://www.sciencedirect.com/science/article/pii/S0268401219302014>
10. T, Hariguna., U. Rahardja. and Q. Aini., 2019. Effect of Social Media Activities to Determinants Public Participate Intention of E-Government.
11. Zhang, C., Wu, J., Long, C., Procedia, M. C.-E., & 2017, undefined. (n.d.). Review of existing peer-to-peer energy trading projects. *Elsevier*. Retrieved from <https://www.sciencedirect.com/science/article/pii/S1876610217308007>
12. I. U. Rahardja and S. Raharja, "Artificial informatics," 2009 4th IEEE Conf. Ind. Electron. Appl. ICIEA 2009, pp. 3064-3067, 2009, doi: 10.1109/ICIEA.2009.5138764.
13. Chang, J., Lee, C., Pan, W., Chou, W., reports, H. H.-S., & 2017, undefined. (n.d.). Estimated daily intake and cumulative risk assessment of phthalates in the general Taiwanese after the 2011 DEHP food scandal. *Nature.Com*. Retrieved from <https://www.nature.com/articles/srep45009>
14. Wullur, M., Episentrum, J. K.-J., & 2020, undefined. (n.d.). Sistem Informasi Geografi dan Rantai Pasok: Bagaimana Geografi Dapat Memperkuat Analisis Rantai Pasok? 103.123.108.6. Retrieved from <http://103.123.108.6/index.php/jepicentrum/article/view/1810>
15. U. Rahardja., A. N. Hidayanto., T. Hariguna., & Q. Aini. (2019, November). Design Framework on Tertiary Education System in Indonesia Using Blockchain Technology. In 2019 7th International Conference on Cyber and IT Service Management (CITSM) (Vol. 7, pp. 1-4). IEEE.
16. Chen, S., Liu, X., Yan, J., Hu, G., Shi, Y., & Liu, Xingchen. (2020). Processes, benefits, and challenges for adoption of blockchain technologies in food supply chains: a thematic analysis. *Springer*. <https://doi.org/10.1007/s10257-020-00467-3>
17. Tian, F. (2016). An agri-food supply chain traceability system for China based on RFID & blockchain technology. 2016 13th International Conference on Service Systems and Service Management, ICSSSM 2016. <https://doi.org/10.1109/ICSSSM.2016.7538424>
18. P. A. Sunarya, U. Rahardja, and D. D. Immaniar, "Development Assessment Module Portfolio E-Imei Students With Learning To Improve The Quality Of Concentration Case Study Mavib," vol. 13, no. 8, pp. 3597-3606, 2016.
19. U. Rahardja, T. Hariguna, and W. M. Baihaqi, "Opinion mining on e-commerce data using sentiment analysis and k-medoid clustering," Proc. - 2019 12th Int. Conf. Ubi-Media Comput. Ubi-Media 2019, pp. 168-170, 2019, doi: 10.1109/Ubi-Media.2019.00040.
20. Food Distribution - The New York Times. (n.d.). Retrieved April 22, 2020, from <https://www.nytimes.com/topic/subject/food-distribution>
21. Chammem, N., ... M. I.-J. of A., & 2018, undefined. (n.d.). Food crises and food safety incidents in European Union, United States, and Maghreb Area: current risk communication strategies and new approaches. *Ingentaconnect.Com*. Retrieved from <https://www.ingentaconnect.com/content/aoac/jaoac/2018/00000101/00000004/art00006>
22. Qurotul, Aini. (2019). Understanding How Gamification Influences Behaviour in Education. *International Journal of Advanced Trends in Computer Science and Engineering*.
23. I, Handayani., U., Rahardja., E, Febriyanto., H, Yulius., & Q, Aini. (2019, October). Longer Time Frame Concept for Foreign Exchange Trading Indicator using Matrix Correlation Technique. In 2019 Fourth International Conference on Informatics and Computing (ICIC) (pp. 1-5). IEEE
24. Husni Sumana *International Journal of Advanced Trends in Computer Science and Engineering - 2019*
25. M, Prawira., H. T, Sukmana, V, Amrizal., & U, Rahardja. (2019, November). A Prototype of Android-Based Emergency Management Application. In 2019 7th International Conference on Cyber and IT Service Management (CITSM) (Vol. 7, pp. 1-6). IEEE.
26. Blummer, T., Sean, M., & Cachin, C. (2018). *An Introduction to Hyperledger*.
27. Sudaryono, U. Rahardja, and N. Lutfiani, "The Strategy of Improving Project Management Using Indicator Measurement Factor Analysis (IMF) Method," in *Journal of Physics: Conference Series*, 2020, vol. 1477, no. 3, doi: 10.1088/1742-6596/1477/3/032023.
28. Tse, D., Zhang, B., Yang, Y., Cheng, C., & Mu, H. (2018). Blockchain application in food supply information security. *IEEE International Conference on Industrial Engineering and Engineering Management, 2017-December*, 1357-1361. <https://doi.org/10.1109/IEEM.2017.8290114>
29. Kim, H. M., & Laskowski, M. (2018). Toward an ontology-driven blockchain design for supply-chain provenance. *Intelligent Systems in Accounting, Finance and Management*, 25(1), 18-27. <https://doi.org/10.1002/isaf.1424>
30. Saberi, S., Kouhizadeh, M., Sarkis, J., & Shen, L. (2019). Blockchain technology and its relationships to sustainable supply chain management. *International*

- Journal of Production Research*, 57(7), 2117–2135.
<https://doi.org/10.1080/00207543.2018.1533261>
31. Nguyen, D., Ding, M., Pathirana, P. N., & Seneviratne, A. (2020). *Blockchain and AI-based Solutions to Combat Coronavirus (COVID-19)-like Epidemics: A Survey*.
<https://doi.org/10.36227/TECHRXIV.12121962.V1>
32. Koirala, J., Acharya, S., Neupane, M., Phuyal, M., Rijal, N., & Khanal, U. (2020). Government Preparedness and Response for 2020 Pandemic Disaster in Nepal: A Case Study of COVID-19. *SSRN Electronic Journal*.
<https://doi.org/10.2139/ssrn.3564214>