

Technology-enabled Fairness? Reflections on Fairness within Blockchain-based Supply Chain Consortia

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This paper was presented at the EURAM (European Academy of Management) 2023 Conference in Dublin (14–16 June 2023). It is part of the conference proceedings:

ISSN 2466-7498 and ISBN 978-2-9602195-5-5

Technology-enabled Fairness?

Reflections on Fairness within Blockchain-based Supply Chain Consortia

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Keywords: fairness • blockchain consortium • governance • philosophy of technology •
business ethics • coffee supply chain

Abstract:

Technologies are supposed to make processes faster and more efficient. Can they also improve social interaction morally? Blockchain technology is said to lead to greater fairness through transparency and accountability. In this paper, we explore the extent to which this expectation is true.

Using the coffee supply chain as an exemplary use case, we examine the extent to which the use of blockchain can contribute to greater fairness in global supply chains. We argue against a hasty equation that transparency automatically entails more fairness. Rather, we cite other factors that are necessary for fair behavior. One important factor are supply chain laws that legally enforce compliance with human rights along the supply chain.

Methodologically, we follow an interdisciplinary approach that combines ethics and computer science. The elaborated ethical approach to fairness is based on a linguistic approach on the one hand, and on John Rawls's concept of *Justice as Fairness* on the other hand, which highlights fair behavior not least as rational behavior that benefits everyone. The level of governance thus addressed is also considered from the technological side. We argue for fairness to

be a guiding principle within the IT governance of blockchain consortia. This relates in particular to trust, legal compliance, decision-making, decision rights and responsibilities.

To provide empirical support for the statements made, we conducted a literature review as well as interviews with various actors in a specialty coffee supply chain, which provides evidence of an interest in fairness from very different stakeholders.

We conclude that blockchain is a suitable way to give technological form to a societal will for more fairness in global supply chains, but that it can never replace the human will for transformation for good.

1. Introduction

How does technology change society? – This is one of the emerging social questions. It is quickly followed by another question, now with an ethical connotation: How can technology change society for the better? The field that this opens up is vast. In the following, we focus on a particular technology and we consider it in a particular context. We ask, to what extent can blockchain contribute to greater fairness in the global coffee supply chain.

This question implies two assumptions. First we assume that there is a need for optimization in the existing coffee supply chain in terms of fairness. Second, we assume that the use of blockchain technology is a viable way to contribute to such optimization. The first point is largely based on interviews we conducted with stakeholders along the supply chain. It also requires a definition of what fairness can mean in the context of supply chain management. We will consider both of these points.

Considering the second point, it is by no means arbitrary for the authors, a computer scientist and an ethicist, to deal with blockchain in the context of fairness in supply chains. Rather, a connection between blockchain and fairness can be found both in societal expectations (Geißler, 2022) and in the marketing of providers of corresponding software solutions (Sopek,

2022). The connection has also found its way into the research literature (Miatton & Amado, 2020). To us, this connection often seems axiomatic. We have therefore set ourselves the task of investigating the extent to which the use of blockchain in a specific use case can actually contribute to greater fairness and the extent to which there are nevertheless permanent limits to this noble desire.

Our research question includes the following three sub-questions: Why should the coffee supply chain be fair at all? What about fairness in conventional processes? Which requirements need to be considered for blockchain-based governance structures to increase fairness?

The first two questions already indicate that the coffee chain as a global supply chain has a particularly high discrepancy in the living conditions of those involved. On the one hand, there are the coffee farmers in the country of origin. They are predominantly characterized by high dependence on exporters and precarious living conditions. They and their employees often do not even know what coffee tastes like. On the other hand, there are the consumers in the destination country. They enjoy a luxury good that is not essential to life but has become an everyday commodity. In between, there are stakeholders lined up along the chain. In between, there is also a division of profits that is rarely made in favor of the coffee farmers. Only about 10% of the profits from the coffee trade are received by farmers in the so-called bean belt, due primarily to dependencies and unequal power relations within the supply chain (Samper et al., 2017, p. 3). 40% of the sub-Saharan population lives below the international threshold of one dollar a day (Naudé, 2010, p. 101). At the same time, efforts are being made to remedy this state of affairs, which is perceived as a malaise. The motives for this vary. Some have long been committed to fair trade for ethical reasons. Others are confronted with the need to change their existing processes, at the latest with the European Supply Chain Act. An underlying “Proposal for a Directive on corporate sustainability due diligence” was adopted by the European Commission in February 2022. The aim is “to foster sustainable and responsible corporate behaviour

and to anchor human rights and environmental considerations in companies' operations and corporate governance," according to the official statement (European Commission, 2022). The imposed duty of care, which will already apply by state law in Germany, for example, from 2023 (BMWK, 2021), also comes with a documentation requirement, which is what makes blockchain interesting as a technology of transparency from a corporate perspective.

The interdisciplinarity of our approach is reflected in the fact that we take two starting points in the following. First, we choose an ethical approach. The topic of governance is understood here as one of political philosophy and fairness is explained in its meaning according to John Rawls. Then, we will take a technological approach. Here, the characteristics of blockchain consortia will be discussed in more detail. In particular, we will identify problems and argue for fairness as a topic of IT governance. We then present the selected use case of the coffee supply chain with reference to interviews conducted. Finally, we form a synthesis of computer science and ethical approaches to make well-founded statements about the potential of blockchain technology in the presented use case and put them up for further discussion.

2. Research Design

Our research goal was to use a specific use case to investigate the extent to which blockchain can contribute to greater fairness compared to the previous process without this technology. We chose the specialty coffee supply chain as use case. On the one hand, the situation in the food supply chain is particularly well suited for the use of blockchain, as traceability and transparency about processes are required here. On the other hand, the aforementioned supply chain laws ensure that corresponding technologies are also in demand from a corporate perspective. This can be seen, for example, in the fact that IBM Food Trust offers corresponding software solutions. In addition, coffee is an excellent product for thinking about fairness along

the supply chain, because the existing processes are perceived as unfair by the various stakeholders, as will be shown. That this example is predestined to reflect fairness is shown not least by the fact that it has already been considered in the research literature. Miatton and Amado examined fairness in the context of transparency and traceability in the coffee value chain using blockchain innovation (Miatton & Amado, 2020). They introduced the idea of a Commodity Fairness Index used to measure the inequality, or economic imbalance. Finally, we chose specialty coffee because it is a clearly definable food supply chain that is also small enough to be adequately captured in our study. Investigating fairness in this small industry setting also offers high potential for generalizing our findings to other agricultural supply chains.

The interplay between technology and ethics led us to conduct interdisciplinary research with expert perspectives, which are reflected in the following two starting points A and B.

In order to find out the realistic needs of the stakeholders along the coffee supply chain and thus get a more practice-based idea of fairness, five interviews between April and July 2022 were conducted. The interviewees consist of a coffee farm owner from Vietnam as well as managing directors of roasteries and distributors within the specialty coffee supply chain (*Table 1*). The interviews lasted approximately 90 minutes each and were conducted digitally via common communication platforms. This allowed us to include the perspective of both coffee farmers in a country of origin and roasteries or distributors in a destination country. The interview guide is based on the IT governance dimensions decisions and decision rights, accountabilities as well as incentives by Weill (Weill, 2004). Here, the governance perspective has been viewed, as it is responsible for the implementation of the potentials of the Blockchain (section 4).

From the two complementary starting points, supplemented by insights from practice, we finally formed a synthesis to answer the question of the extent to which the use of blockchain in the specific use case is suitable for achieving greater fairness.

3. Starting point A: an ethical approach towards fairness

In this section, we first explore the meaning of “fairness”. Then we turn to the talk of fairness in the context of blockchain. We connect both with an approach of political philosophy according to Rawls and relate it to governance in blockchain consortia.

3.1. The meaning of fairness

When we ask about the meaning of fairness, we first do so literally. Etymologically, something that is “fair” has a positive connotation from the start. This is remarkable from a philosophical point of view, because in linguistic understanding “fairness” is always on the side of the good and desirable. Something pleasant or beautiful could initially be called fair (Harper, 2014). This good, however, soon became a morally good in understanding. The word of Gothic origin “fair” was then what the word of Latin origin “just” means. This is how it has remained until today. The moral understanding found its way into the field of competition, first in sports (with the early counter term “foul”), but then also in the field of trade (with the early counter term “contraband”) (Weekley, 1967, p. 544). The word “fair” in both cases refers to a particular type of interaction within a multi-actor system that is considered good and desirable. A person cannot be called “fair” in isolation. Rather, what is called fair is a person’s action or disposition within a space of action that he or she shares with other actors. This space of action can in turn be characterized by fair conditions. If one expects fair conditions, one expects, according to the usage of the language, that things should be done honestly and justly. However, this presupposes the conception of something honest and just, in relation to which it is necessary to come to an agreement. The idea of competition in sports and trade also refers to an interaction in which the advantages of one are directly related to the disadvantages of the other. Fairness in this context means that competition and cooperation are in balance (Copray, 2012, p. 504).

Therefore, the notion of fair trade or fair play is associated, first, with the expectation that benefits should be obtained only in a fair manner and, second, that all participants have fair opportunities to obtain those benefits in the long run. In this respect, fairness can also be understood as a “mediating idea,” as Fischer puts it (Fischer, 2012, p. 16). Fairness refers to a process or a solution that is supported by the majority of those involved, he says (Fischer, 2012, p. 15).

3.2. Fairness in blockchain-based supply chains

If we now understand supply chains as a system that connects different actors, it is not surprising that fairness is also talked about in this particular trade context. This can be seen from the fact that the literature on fairness in the supply chain context is mainly concerned with fairness in processes and distribution, and how stakeholders interact with each other (Chen et al., 2022, p. 67).

To come closer to the ideal of fair cooperation in reality, there are rules in trade just as there are in games. If everyone abides by the same rules, at least a formal fairness is fulfilled. Informal fairness would deal with the attitudes of the players or traders (Loland & Court, 2003, pp. xiii f.). It is the concept of formal compliance with rules that makes it possible to speak of fairness in the context of blockchain as well. After all, this technology is associated with the promise of a system in which all participants have no choice but to abide by the rules – at least not without being immediately convicted of breaking the rules and having to expect punishment.

In this respect, it is obvious to even think of a particularly fair socio-technical system here. An inevitable conformity to the rules promises more fairness than a card game, in which there are clear rules but cheating is not necessarily immediately noticeable; or the soccer game, in which the question of whether the rules were still observed or just no longer is to a certain extent left to the discretion of the arbitrator, who may also be mistaken. But who actually made

the rules? And to what extent do these rules also meet the needs and expectations of those who join later, or the needs and expectations of those who do not participate directly in the interaction but are affected by its consequences? So who guarantees that the rules applied are those in favor of fairness? – These questions will lead us to the level of governance in the following.

Before that, it is worth noting that blockchain is often associated with fairness, arguing that the transparency provided by the technology contributes to a more equitable distribution of profits along the supply chain. However, there is often a gap in the argument when it comes to how exactly transparency enables fairness. For example, the FairChain Foundation simplistically suggests that the concept of radical transparency contributes to a more equitable distribution of wealth (FairChain, 2019). But the fact that it is visible that farmers receive the smallest share of profits is not a compelling reason for the current beneficiaries to change this distribution. It is therefore important that the focus is not on a supposed equation of transparency and fairness, but that thought is given to motives and incentives for fair behavior. Thus, informal fairness must also be thought about beyond the technical possibilities. This is also the case with FairChain. The foundation also states that it wants to replace development aid with sustainable consumption. This motivation differs from a profit-oriented one, which may also be interested in fairness, but rather according to the motto “fairness pays off” (Amesberger, 2015, p. 8). Fairness could actually pay off. At least, that is what consumers said when asked about the criteria in their purchasing decisions (Butera, 2011).

In our view, there is a strong case for adopting fairness as a guiding principle for the interaction within the supply chain, particularly the global coffee supply chain. We also assume that this guiding principle should be at the core of the IT governance of blockchain supply chain consortia. Before we elaborate on these ideas, however, we first take a look at Rawls’s concept of fairness. We do so not only because within ethics the topic of fairness is clearly linked to his

Theory of Justice (Rawls, 1971), but precisely because his anchoring of the idea of fairness at the governance level is also instructive for the design of IT governance.

3.3. Justice as fairness in a blockchain consortium

Rawls's concept of *Justice as Fairness* (Rawls, 2001) is in the background of the following considerations. However, it is not necessary for our purpose to be already familiar with this concept or to know it in detail. The most important points for our purpose will be mentioned. We consider his theory under the question of the extent to which it can be applied to blockchain consortia. To do so, it is helpful to consider Rawls's presuppositions.

First, Rawls notes a plural starting point. There are doctrines that make statements about what is just, but these doctrines do not always agree. This results in different conceptions of justice. The second assumption lies in the democratic constitution of the society in which Rawls finds himself. Consequently, the answer to the question of what is just lies neither with a tyrant nor with oligarchs, but with free and equal citizens. Both together raise Rawls's initial question: What conception of justice can free and equal citizens agree upon despite differing views? Rawls's answer was that it is crucial that the process of agreeing on certain principles itself takes place under fair conditions. The concept he was looking for was the concept of justice as fairness.

Now, anyone who is asked to design IT governance is first faced with the same basic problem as Rawls. There are a lot of requirements. They do not always seem compatible. And now these requirements are to be met with a concept that takes them into account. If a requirement is that processes should be fair, the designer must also know what is meant by fairness. Perhaps there are different stakeholders and they have different ideas about this. Should the designer now simply go along with the understanding that he or she themselves find meaningful? Or is there an authority that makes a hierarchical decision? If the designer wants to do it

like Rawls, he or she will look for a democratic consensus (cf. §11 *The Idea of an Overlapping Consensus* | Rawls, 2011), and then it will probably occur to him or her that blockchain could be a suitable technology for this. After all, one read again and again, especially at the beginning of the technology, that blockchain would bring democratic conditions and could reduce dependencies on monopolists. Reference was often made to technical decentralization, which was equated with a decentralization of power without much thought. We advise against equating a technical possibility with a social reality in this way. Magnuson has already noticed how quickly social hopes were faded by technical realities (Magnuson, 2020, p. 90). Hermstrüwer also criticized a hasty equation of decentralization and democratization and rather looked for concrete design options in favor of democracy (Hermstrüwer, 2019). We agree with this line of thinking and assume that the blockchain consortium is a good technical basis for negotiating interests; not because data storage is decentralized, but because it is technically possible to involve different stakeholders equally in a decision-making process. We also assume that it will be possible in this way to approach fairness understood as procedural justice enabled by technology.

One could say our designer is roughly where Rawls's fictional protagonists are in his thought experiment of the *Original Position* (cf. §6 *The Idea of the Original Position* | Rawls, 2001). If he or she wants to think about requirements in favor of fairness within a coffee supply chain, he or she would actually have to get representatives of all stakeholders along the supply chain. These representatives should not know whether they will be coffee farmers or consumers in the end. Now they should agree on which principles of fairness should apply within the blockchain consortium. Assuming the same initial conditions as in Rawls's actual experiment, the exemplary protagonists of the supply chain should also come to the same conclusion: Justice is when all participants have equal access to the same system of freedoms. Inequalities are only

allowed if everyone has a fair chance to reach the better position and if even the least advantaged are still better off by the inequalities than under conceivable alternatives (cf. §13 *Two Principles of Justice*). Just as Rawls sees society as a fair system of cooperation (cf. §2 *Society as a Fair System of Cooperation*), the exemplary protagonists of the coffee supply chain are likely to see the blockchain consortium as just such a system. They, too, will seek a model of cooperation that is not only fair, but also beneficial to all.

The question of how realistic the thought experiment is is futile and was often asked, not least during Rawls's lifetime. From our point of view, it raises awareness of the problem of finding criteria within IT governance, especially if it is not to be hierarchically prescribed, but democratic and above all fair. At the same time, undeniable weaknesses of a thought experiment show how important it is to know real interests of the various participants. Every designer, like every ethicist, must come up against human limitations when he or she tries to abstract from themselves and imagine, for example, what fairness means to a coffee farmer in Vietnam. Not least for this reason, we talked to stakeholders and experts to elicit a realistic understanding of fairness and unfairness in the speciality coffee supply chain we have chosen as an example. We will present the results later. In the evaluation, we will also come back to Rawls and ask to what extent a blockchain consortium is actually comparable to the well-ordered society based on cooperation (cf. §2 *Society as a Fair System of Cooperation*). First, however, we return to starting point B asking about fairness from the computer scientist's point of view.

4. Starting point B: blockchain's promise of fairness

Within this section, first the blockchain technology including its technical background as well as potentials are outlined. Furthermore, the current state of research of blockchain governance with regard to fairness is discussed.

4.1. Blockchain as a disruptive technology

Blockchain technology has a number of distinctive features that set it apart from other technologies. Key characteristics include decentralization, immutability, security and transparency (Sultan et al., 2018). A blockchain is a digital accounting system used to track and secure transactions. The blockchain consists of blocks of transactions that are chained together to form a record of transactions. Each block in the blockchain contains a record of transactions, a timestamp, and a reference to the previous block. The blocks are chained together using a cryptographic function that makes it impossible to subsequently change a block without also changing all subsequent blocks. That is why blockchain is considered to be very secure. Lu also points to trustworthiness (Lu, 2018). The latter is misleading, insofar as a technology can neither be compared to nor replace a trusted person (Fries, 2022). What blockchain actually does is provide security through visibility of data and the aforementioned cryptography, which can take the place of previous trust.

Furthermore, there are several types of blockchain technologies that differ in their architecture, purpose and scope of use. Public blockchains are accessible to anyone and allow any user to perform transactions and become part of the network. Examples of public blockchains are Bitcoin and Ethereum (Sheth & Dattani, 2019). Private blockchains are reserved for specific individuals or organizations and access is permissioned. They are often used in companies and organizations to optimize and accelerate internal processes. Consortium Blockchains are operated by a group of companies or organizations and are not accessible to the public. They are often used to improve processes in industries where multiple companies collaborate, such as the financial or supply chain sector (Dib et al., 2018). Lastly, Hybrid Blockchains combine elements of public and private blockchains and can be adapted as needed. They offer the flexibility and adaptability of private blockchains and the security and transparency of public blockchains (Alkhateeb et al., 2022).

The functionality in combination of the shown properties and different types opens great potential for different fields of application. Especially in the supply chain, transparency can be improved. By using blockchain technology, all parties involved in the supply chain can see at any time where a product is in the delivery process and who handled it beforehand. Furthermore, faster processing of transactions is possible, as no manual processing steps are required. The immutable records on the blockchain can help prevent fraud because every transaction is recorded immutably. Last, the technology enables all participants in the supply chain to collaborate and exchange information on a common platform (Chang & Chen, 2020). In terms of ethics, blockchain is also considered as a promising enabler for improved compliance. On the one hand, the technology offers the technical potential to document, track, and prevent the use of child labor and other violations of labor standards. The blockchain can also support compliance with other human rights. Accurate data documentation and its traceability is promised to ensure that no practices that violate human rights are taking place along the supply chain. In addition, companies can prove and track compliance with environmental standards, e.g., by tracking CO₂ emissions along the supply chain. On the other hand, the technology can also help companies track their compliance with safety standards in the supply chain and ensure that no dangerous or harmful products are produced or distributed (Hyrnsalmi et al., 2019).

To fully realize these potentials, it is important to have a solid governance structure that regulates the use of blockchain and ensures that the technology is used in an ethical and responsible manner.

4.2. Blockchain governance towards fairness

Governance generally refers to the rules, procedures and mechanisms that determine how an organization or system is directed, controlled and managed. Governance encompasses the full range of decision-making processes and structures required to manage and control an

organization or system. The goal of governance is to achieve the goals of the organization or system and to protect the interests of the stakeholders (Benz, 2004).

Governance has an important role in promoting fairness in an organization or system. Fairness refers to ensuring that all stakeholders are treated equally and that decisions are made on the basis of justice and equity. An important element of governance is adherence to rules and procedures that ensure decisions are made in a transparent and accountable manner. This helps build trust in governance structures and ensure that all stakeholders are treated fairly. To ensure fairness in governance, it is also important that all stakeholders have access to information and have the opportunity to represent their interests. This can be achieved through mechanisms such as open decision-making processes, stakeholder participation, and embracing diversity and inclusion (Baker et al., 2016).

The starting point for successful governance is the different application areas, business models as well as the specific challenges that blockchain technology implies. A first approach to address this issue in a tangible way is proposed by Beck et al. The authors discuss the dimensions (decision rights, responsibilities, incentives) of IT governance defined by Weill along the blockchain economy and propose key questions of the dimensions in the form of a research agenda (Weill 2004; Beck et al., 2018). So far, only few scientists have made an ethical reference. Hofman et al. take up Beck's agenda and created a governance analysis framework that attempts to capture the embeddedness of blockchain solutions in the broader world. They relate existing power structures (legal, political, environmental, social) to the 5W1H method and describe this as follows: Who? (*actors and stakeholders*), What? (*data, records, and logs*), Why? (*use cases and added values*), When? (*temporality and change over time*), Where? (*geography of instantiation*), How? (*instantiation*) (Hofman et al., 2021). This was the first time the term "social" came up in connection with blockchain governance. Furthermore, Yue et al. propose a framework that consists of six governance attributes and 13 sub-attributes (Yue et al., 2021).

The governance attributes are composed of decision-making processes, accountability and verifiability, privacy and security, trust, incentives, and effectiveness. From their perspective, successful implementation of governance measures can be achieved from a mix of two ways: organizational mechanisms and human interaction. Thereby, the attribute “trust” is associated with fairness, as an effective governance is based on participants trusting that decisions are fair, properly executed, privacy-protected, and highly tamper-resistant with decision policies transparent and accessible (Yue et al., 2021). The authors also consider the topic area of ethics within their proposed comprehensive blockchain governance framework including six principles. The fairness idea is mentioned here within two principles. First, blockchain governance should enable transparent decision processes for trust, to have insights in reasonableness and traceability. Second, a successful governance should manage legal compliance and ethical responsibility. This should ensure that all governance-related decisions and processes conform legal regulation and ethical responsibilities (Liu et al., 2021). Another approach by Anthony Jnr. refers to the structures and concepts of governance in companies and describes them in relation to the blockchain. In addition to economic, technological and political factors, he also describes the social factor. He notes that fairness is mainly characterized by the distribution of decision rights and a clear structure in decision-making (Anthony Jnr., 2022).

Overall, the key aspects that are addressed within blockchain governance towards fairness are trust, legal compliance, decision making, decision rights and accountability. Here, the central question now arises: How can fairness be established through trust, decisions and decision rights, as well as responsibilities within a consortium?

5. Case study: towards fairness in a coffee supply chain

As already described within section 2, the interviews were conducted on the basis of Weill's IT governance dimensions: incentives, decisions and decision rights, as well as accountabilities (Weill, 2004). The idea of ethics or fairness was addressed in each of the dimensions within the interviews. In order to present how the interview partners envision fairness within a consortium, the current situation and then the potentials and challenges in implementing fairness in a consortium are outlined below.

5.1. Current state of fairness

Considering fairness, the interview partners clearly state that there are major deficits even in the specialty coffee supply chain.

Starting from the perspective of the farmers, unfairness can be viewed from different angles. In complicated years, such as those of the COVID-19 Pandemic, coffee farmers are on their own. To a large extent, there is no support from the other stakeholders within the supply chain, which is also evidenced by several reviews (Aday & Aday 2020; de la Peña García et al., 2020). While other companies in consumer countries receive government support, farmers must rely on revenues from previous years, which is not always a given. Although coffee is considered one of the best-selling products and “trails only oil in global trade volume,” as Smith notes (Smith, 2013, p. 163), the farmers, who grow the coffee and are largely responsible for the final product, belong to the social underclass. This is also accompanied by a lack of understanding and use of technology in producer countries. Technologies enable data and information visibility that can support and improve a company's strategic goals. Based on the missing data insights, the farmers lack on know-how how to improve quality, as it is difficult for them to get feedback about their product. Furthermore, the farmers often have few educational opportunities, which in turn leads to a lack of knowledge in how to allocate funds and how to invest in

innovate machines or support tools. Last, the interview partners recognized a problem considering the pricing of the coffee along the value chain. Farmers have to sell a certain amount of coffee to keep a minimum standard of living. This results in limited co-determination right in pricing, as they are dependent on the quantity purchased by buyers.

From the perspective of roasteries and distributions, the interviewees agree, that the difficult communications between farmers and other stakeholders supports the unfairness within the value chain. Thus, sellers in consumer countries rely on information from intermediaries. Either no information at all is available about the working conditions and social circumstances, or just few. This often leads to greenwashing and an exchange of information that trivializes the social circumstances in the country of origin. Although this is not as common in specialty coffee as in industrial coffee, it is a major problem for all concerned.

The results showed that especially distributors or roasters who are in direct contact with customers perceive a strong responsibility towards the farmers. However, implementing the improvement in living conditions is not simple, as the customer must be explained why the coffee is now more expensive, even though no improved quality is presented in the short term. In addition, without accurate proof, customers who are willing to pay more for fair trade coffee simply have to trust that the additional price will actually reach the farmer (Smith, 2013, pp. 167 f.).

Overall, these aspects lead to injustice as well as unfairness towards farmers. Now, the question arises: Which issues could a blockchain-based consortium address and counteract in order to increase fairness towards farmers as well as other supply chain stakeholders and participants?

5.2. Blockchain potentials and challenges towards fairness

The potential that blockchain technology offers has already been addressed in section 4. If we now add the findings of the interviews, we can focus on the question of the extent to which the use of the technology can improve the exchange and transparency of information within the coffee supply chain. The fairness to be improved, then, lies first in fair access to information. Improved fairness in terms of access to information benefits not only coffee farmers in the growing countries, but also traders, roasters and customers. Farmers recognize the value of their hard-earned product in the consumer countries and can thus improve their negotiating position. Traders can increase efficiency and save time and storage costs. Roasters have better arguments for their price calculations vis-à-vis customers. Customers can check whether their investments are really investments in fair trade.

As the interview partners outlined, especially the long-term relationships that could be established through a blockchain-based consortium, could improve both, quality as well as fairness. The secondary fairness that follows then also goes beyond mere information fairness and can extend into improving living conditions in the country of origin. The connecting blockchain consortium could counter opportunistic behavior by participants leading to a fairer environment of all actors within the consortium by strengthening trust among participants. As all stakeholders along the value chain, including the customer, are involved in a possible consortium, communication with other participants and especially with end customers can be improved. This in turn leads to a strengthened marketing for distributors creating a Unique Selling Point (USP) through a fair and sustainable sourced product. Furthermore, due to the transparent supply chain, the coffee farmers could be involved in the coffee pricing and long-term contracts could be concluded to enable prepayment processes for the farmers. This leads to an improved quality of the starting product. Farmers can invest in machines and further technological innovations

to automate their works and thus enhance fairness. The last potential is about consulting strategies regarding technological and organizational perspectives. Companies from consumer countries could thereby support the farmers and simultaneously improve their own product and marketing strategies. Consulting could take place considering the allocation of funds and investments as well as in the form of social projects.

As outlined above, blockchain provides many potentials, but there are also technological as well as organizational challenges for improving fairness within a consortium. As the interview partners state, on one hand, the implementation of blockchain at the beginning of the chain would be a major challenge. This relates primarily to infrastructure, education, regulation, acceptance and financing. In many developing countries, the technical prerequisites for using blockchain technology may not exist or may be insufficiently developed. These include, for example, stable power supply, Internet access and hardware. To this end, there may be a lack of qualified professionals capable of implementing and managing blockchain technology. There is also a lack of regulatory mechanisms or legal frameworks that support or enable the use of the technology in these countries. Due to the lack of understanding, acceptance towards the technologies also suffer. Last, integrating blockchain technology in developing countries may require significant investments that may not be available or may be difficult to obtain.

6. Conclusion: blockchain's contribution to greater fairness in a coffee supply chain

To what extent can blockchain technology enable fairness in the coffee supply chain? What follows is a final synthesis that also addresses previously unanswered questions. First, it is important to note that we are deliberately writing about enabling. No technology is a panacea that, once implemented, will eliminate social ills. We should not and cannot expect that from blockchain either. The media sometimes gives a different impression, and of course we are

dealing with understandable human hopes here. But it is important to distinguish between technical possibilities and exaggerated expectations in order to sensitize people who use technologies to their own responsibility.

The starting point in political philosophy with recourse to Rawls shows that fairness does not have to be understood as the utopia of philanthropic moralists. With Rawls, fairness is rather a rational behavior of people in social interaction. If you behave reasonably, you behave fairly, we can take from this. This philosophical insight, which is known to be found in various game theories (Laden, 1991), coincides with statements we have gained from the practice within the coffee supply chain. The roasters also benefit if the farmers at the other end of the supply chain have better living and working conditions. They do not have to act out of pure philanthropy. Perhaps intermediaries would choose differently because they may not directly benefit to the same extent. This is where applicable laws come into play. With the EU Supply Chain Act, at the latest, it is worthwhile for all parties involved to prove that they are acting in a fair and sustainable manner so as not to risk penalties.

So the question of why one should behave fairly at all, which is of course a variation on the very familiar question in ethics, “Why be moral?” has found three possible answers for our concerns. The first possibility already confronted us linguistically: Fairness as the good and the just is understood, at least by many people, also as the desirable, which they can intrinsically also want to achieve. The other possibility can be described, based on Rawls, as rational or game-theoretical, insofar as one behaves fairly because it also increases one’s own advantages. A third possibility comes into play with the laws and a fear of punishment. The literature also includes the idea of fairness as a fundamental human right (Amesberger, 2015, p. 7). The understanding as a human right implies that there should also be corresponding structures and institutions to enforce fairness; also in the economic sector and thus also in the supply chain. One technical-structural basis can be seen in blockchain technology. This is true irrespective of

the many challenges, especially those relating to the availability of infrastructure, that have been mentioned in section 5. To overcome these challenges, it can be helpful to work closely with local communities and affected stakeholders to address their needs and requirements. It may also be helpful to seek support from international organizations and development banks to promote the integration of the technology in developing countries.

An open point so far is to what extent a blockchain consortium can be compared to Rawls's well-ordered society. The big difference is the respective scope. Rawls thought of a democratically constituted state with a binding constitution as its basis and corresponding binding rights in the congruent legal space. In contrast, the coffee supply chain as a global supply chain moves across national and legal borders. The same is true for the blockchain consortium that represents these global differences. The consortium will not adopt a state constitution and the corresponding sanction options will also remain absent. However, if blockchain is used as a common technical basis, this can be compensated for to a certain extent. Even if the blockchain consortium is formally more similar to an association structure than to a state, it is still possible to identify similar mechanisms in regulation, which are reflected in particular in IT governance.

Governance ethics is addressed in the context of business ethics and virtue ethics (Wieland, 2006). Schramm, for example, speaks of a "management of moral interests" (Schramm, 2017). In starting point B, we have seen that concepts of IT governance increasingly also refer to ethical foundations. Although the term "fairness" remains mostly fuzzy, especially in the still new field of blockchain governance, it is mentioned in connection with business ethics and business responsibility. It should be recalled that governance is the task of defining decision-making processes and structures necessary for the management and control of an organization or system. It is in line with the corporate goals. Whether the company is advocating fairness out of conviction, improving efficiency, or simply complying with the law, it will come

back to fairness. Blockchain in the coffee supply chain combines aspects of fair trade, fair governance, and fair participation. The benefits are not only for the coffee farmers, but also for the participants within a blockchain-based supply chain consortium in consumer countries, who can derive considerable added value from increased fairness. The fact that fairness is also seen as contributing to long-term economic success (Fröhlich & Glaner, 2007, p. 40) makes fairness so appealing for company use, even for non-ethically argued reasons. Whether out of intrinsic interest, due to legal requirements or because this is currently demanded and rewarded by customers (Auger et al., 2003), companies themselves are committed to a transformation of business for good.

The importance of transparency with regard to processes and data is repeatedly emphasized in this context. This is evident both in the research literature and in the conversations with the interview partners presented above. More transparency is often expected to lead to more fairness, as if it were a matter of course. Via the link of the transparency idea, one then very quickly comes to the assumption that blockchain as a technology of transparency automatically leads to more fairness. We have shown why we disagree with this equation. Still, there are good reasons to associate blockchain with fairness. It is important to distinguish two dimensions or scopes of addressed fairness here.

The first refers to the technical possibility of fair participation. This concerns the equal representation of different stakeholders as equally empowered members of the blockchain consortium. This can be associated with equally strong decision-making rights and with making it technically possible to achieve a fair balance of interests. This can also be associated with fair access to information for all stakeholders. Whether these technical possibilities find technical realizations, however, stands and falls with the leading governance that supports this way of fairness or not. The same applies here as to the promise of democratization that once accompanied the emergence of blockchain. Just like democracy, fairness is not a self-propelling process

that technology would simply set in motion. Technology can support social change processes, but it is still people who determine the course of these changes. What we can also observe, is that there is very much currently a societal will towards more fairness and towards more sustainability, especially in the supply chain. Under democratic conditions, corresponding laws that are just emerging in the EU must be seen as a reaction to this societal will and not vice versa. Blockchain does not replace this will, but it can be seen as a very good way to give this will a technical basis for implementation. Thus, Thomason et al. rightly speak of blockchain as “a game changer for the poor” (Thomason et al., 2018, p. 138).

The second dimension of addressed fairness points beyond technical reality. Here, it is no longer a question of whether all participants are fairly represented in the blockchain consortium. Rather, it is about the extent to which the use of the technology can also positively influence the social circumstances outside the technology, for example with regard to better wages and better working conditions. Respondents indicated that greater fairness also translates into better product quality, which in turn leads to expectations of long-term economic relationships and better prices. Here, it may indeed be that transparency about pricing for all parties involved can also influence the distribution of profits. This assumption is at least suggested by the interviews conducted. Especially the customers, who can also be participants in an affiliated public blockchain, can exert influence here. If they see through the accurate data documentation that the additional price actually arrives in the country of production, and if they even see to which farmer exactly this additional price goes, they may also be more willing to pay it. A study has shown that even then the majority of them will not pay any price, but will also act according to their own interests, but they are more willing to pay more than before (Degli Antoni & Faillo, 2022).

In this context, it is important to point out a persistent difficulty that limits the ability of technology to change the extra-technological world. In the blockchain literature, reference is

often made to the oracle problem. In short, it is about interfaces between the digital and analog worlds. Illustrated for the coffee supply chain, this means that ultimately the customer in the country of consumption cannot be 100% sure that no child labor took place in the country of origin, even if the data fed into the blockchain is supposed to prove exactly that. It remains humans who make these inputs and are in turn verified by other humans in their workflows. So the reality of data, even with the best technology, is a human-driven reality (Fries, 2023). But it is still the case that blockchain is a technology that makes it much harder for false data not to be seen. It also makes corruption much more difficult. The technical structure also makes it particularly well suited to making processes fairer, as we have seen. And yet, lastly, it must be emphasized once again that blockchain, too, will never by itself lead to specific ethical goals. It is always based on the human will to change the social world for the better, which can be enabled by technology.

Acknowledgements

This research paper is funded by dtec.bw – Digitalization and Technology Research Center of the Bundeswehr, which we gratefully acknowledge. dtec.bw is funded by the European Union – NextGenerationEU. We also thank the LIONS consortium and our research partners for their contributions to this research activity.

Authors have been listed in alphabetical order. The contributions can be attributed to the coauthors as described below:

Isabelle Fries took the ethical perspective. She wrote the introduction, most of the research description, the ethical approach, and the conclusion.

Maximilian Greiner wrote the second approach as a computer scientist. He conducted the interviews, evaluated them, and wrote the case study section.

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Tables

Table 1: Interviewpartner overview

	Zanya Coffee & Roastery	Coffee Roastery Schneid-Coffee	Murmauer Coffee Roastery	Munich Coffee Roastery
Country	Vietnam	Germany	Germany	Germany
Employees	25-30	8-10	20	4
Core service	Cultivation / Processing / Roastery / Distribution		Roastery / Distribution	
Core market	B2B / B2C			
Size	Small and medium sized enterprise (SME)	Family owned small and medium sized enterprise (SME)	Small and medium sized enterprise (SME)	
Experience	Focus on the direct trade business of specialty coffee	Sustainable, organic certified and environmentally friendly production since 2005	Climate neutral since 2019 and active cooperation in climate protection projects	Participate in a research project to digitally track & trace coffee through a blockchain
	Pioneer in redistributing profits and creating stable work conditions for ethnic minority farmers	Experience of natural event: fire destroyed the roasting machine	Following a direct trade trading philosophy and active participation in educational projects for growing countries	Unique corporate concept with competencies from different industry areas
Blockchain knowledge	Advanced	Basic	Basic	Advanced