Journal of Engineering Sciences and Information Technology (JESIT) • Vol 8, Issue 3 (2024) • P: 27 - 16
https://journals.ajsrp.com/index.php/jesit
ISSN: 2522-3321(Online) • ISSN: 2522-3321(Print)

The Blockchain Technology Applications and its Impact on Governance Performance
A Field Study on the Transportation Sector in Palestine

Dr. Maher Fuad Abu Farhah

Faculty of Information Technology | Arab American University | Palestine

Received: 29/07/2024

Revised: 10/08/2024

Accepted: 30/08/2024

Published: 30/09/2024

* Corresponding author: maherabufarhah@gmail.com

Citation: Abu Farhah, M. F. (2024). The Blockchain Technology Applications and its Impact on Governance Performance: A Field Study on the Transportation Sector in Palestine. *Journal of engineering sciences and information technology, 8*(3), 16 – 27. https://doi.org/10.26389/AJSRP.F290724

Abstract: Objectives: Blockchain technology (BCT) is an advance technical solution incorporating many technologies, with the capacity to overcome governance's limitations. As a consequence, our study aims to analyzing how BCT applications affect governance performance (GP), testing the mediating role of operational efficiency (OE) in the ministry of transport in Palestine (MTP). This study was conducted during the period from 2022 to 2024.

Methods: A paper applied research design (Survey), and a study unit consisting of 90 participants at MTP was used out of the target population (110). In contrast, simple random and stratified sampling techniques were applied for the determination of the research sample. Data collected via questionnaires and the study's hypotheses were evaluated using PLS-SEM.

Results:. The main results showed that BCT and their impact on GP from the perspective of employees were high. Until the period of the research, Palestine lacked a clear strategy and policy for the usage of BCT. There was an impact of BCT dimensions on GP at the level of significance. OE has a fully mediating role in the effect of decentralization & traceability and a partial mediating role in the effect of transparency on GP.

Conclusions: The paper advises MTP management to start a sound BCT and invest in it concurrently in order to materialize OE and achieve GP efficiency. Future studies can apply the study model to other sectors to verify the reliability of the model.

Keywords: Blockchain Technology, Applications, Efficiency, Decentralized System, Governance, Ministry of Transport, Palestine.

تطبيقات تقنية البلوك تشين وتأثيرها على أداء الحوكمة
دراسة ميدانية على قطاع النقل في فلسطين

الدكتور / ماهر فؤاد أبو فرحة

كلية تكنولوجيا المعلومات | الجامعة العربية الأمريكية | فلسطين

المستخلص: الأهداف: تُعد تقنية البلوك تشين حلاً تقنيًا متقدمًا يجمع بين العديد من التقنيات، مع القدرة على التغلب على قيود الحوكمة. ونتيجة لذلك، تهدف دراستنا إلى تحليل كيفية تأثير تطبيقات تقنية البلوك تشين على أداء الحوكمة، واختبار الدور الوسيط للكفاءة التشغيلية في وزارة النقل في فلسطين. وقد أجريت هذه الدراسة خلال الفترة من 2022 إلى 2024.

المنهجية: تم استخدام تصميم بحثي تطبيقي (استبيان)، وشملت وحدة الدراسة 90 مشاركًا من وزارة النقل الفلسطينية من إجمالي السكان المستهدفين (110). تم تطبيق تقنيات العينة العشوائية البسيطة والطبقية لتحديد عينة البحث. تم جمع البيانات عبر الاستبيانات وتم تقييم فرضيات الدراسة باستخدام تحليل المسار الهيكلي (PLS-SEM).

النتائج: ظهرت النتائج الرئيسية أن تقنية البلوك تشين وتأثيرها على أداء الحوكمة من منظور الموظفين كانت عالية. حتى فترة البحث، كانت فلسطين تفتقر إلى استراتيجية وسياسة واضحة لاستخدام تقنية البلوك تشين. كان هناك تأثير لأبعاد تقنية البلوك تشين على أداء الحوكمة عند مستوى دلالة. كان للكفاءة التشغيلية دور وسيط كامل في تأثير اللامركزية وتتبع الأثر، ودور وسيط جزئي في تأثير الشفافية على أداء الحوكمة.

الخلاصة: ينصح البحث إدارة وزارة النقل الفلسطينية ببدء استخدام تقنية البلوك تشين والاستثمار فيها بالتوازي من أجل تحقيق الكفاءة التشغيلية والوصول إلى كفاءة أداء الحوكمة. يمكن للدراسات المستقبلية تطبيق نموذج الدراسة على قطاعات أخرى للتحقق من موثوقية النموذج.

الكلمات المفتاحية: تقنية البلوك تشين، التطبيقات، الكفاءة، النظام اللامركزي، الحوكمة، وزارة النقل، فلسطين.

Introduction

The transport sector is one of the main pillars of the national economy and a major contributor to the gross income ratio, as it plays a pioneering role in driving the economy and providing services to other sectors, in addition to providing real opportunities for investment and job creation. For many in developing world cities, the design and implementation of effective transportation infrastructure remain a pipe dream. Transportation-related difficulties will continue to grow, according to the UN, unless aggressive and long-term mitigating plans are enacted (Emory et al., 2022; Gumbo et al., 2022). The Ministry of Transport in Palestine (MTP) has completed many important strategic studies that will contribute mainly to the advancement of the transportation sector to reach an integrated and multimodal transport system that provides the best services for the transportation of people and goods in all fields: land, air, and sea. It fulfills the Ministry's vision of providing a safe, advanced, sustainable, and environmentally friendly transport sector, in accordance with the best international principles and standards in accordance with the sustainable transport development plan 2030, in addition to the strategic sectoral transport plan 2017-2022. There are many great challenges facing the transportation sector in Palestine, such as vehicle life cycle tracking. There are countrywide solutions that use traditional systems (centralized). These solutions have many problems with security level, transparency, trust management, and monitoring, all of which negatively affect the gross domestic product and overstretch the public treasury due to the increase in costs in the transport sector (MOT, 2019; MOT, 2020).

There is a strong need for advanced and reliable technology to increase the efficiency of the transport sector governance in Palestine. This technology has been known as "blockchain", a technology characterized by a set of features that will make the transport sector more efficient, transparent and safer. This demonstrates the great need to keep up with the information and technology revolution by applying BCT for its great advantages. BC has the following advantages compared to central system-databases according to Shetty et al. (2019), firstly, the capability to immediately access a database across a variety of trust limits in situations where it's hard to identify a reliable central arbitrator to impose authorization and isolation restrictions. In the BC, transactions benefit from their own proof and authorization depending on the verification process controlled by several nodes and a consensus mechanism to ensure synchronization. Secondly, the capacity to deliver robustness in a cost-effective way without the need for redundant and costly infrastructure, as well as disaster recovery.

The focus was on the three most important features of the BCT related to the topic of research, which are decentralized, transparency, and traceability. To our knowledge, this is the first study carried out under the MTP. BCT and GP become crucial to the institution and the economy as a result, ushering in a new phase. In light of this, we concur that it is crucial to focus on BCT's ability to manage GP through OE. After a thorough analysis or assessment of the literature. By evaluating the impact of BCT on GP through OE in MTP, this research seeks to address a knowledge gap in the area and to propose a conceptual framework for BC-governance that captures relevant concepts and gives stakeholders & decision-makers a tool to analyze and implement BC in an orderly manner.

1.1 Problem statement

About BC-governance, there's a very obvious lack of research on this, with most academic research focusing on cryptocurrencies like Bitcoin and little knowledge about the effects of BC in the management of economic activities (Beck et al., 2018; Liu et al. 2022). On the other hand, the problem of the study is based on two main points: The first is that the MTP has no connection to service providers such as the Ministry of Interior, Insurance, and banks to automate all transactions electronically and achieve the goal of digital transformation in Palestine. The second is not to give up the existence of a real agent between the owner, the purchaser and the car rental to finish the process electronically, create a kind of regulation (MOT, 2019; MOT, 2021). Therefore, there is an urgent need to implement BCT in the MTP, according to the international experience of this technology in different countries as; thus, the study problem can clarify an answer to the following main question:

Is there any effect of the BC through its distinctive dimensions (Decentralization, Transparency, and Traceability) on enhancing the performance of governance - the Ministry of Transport with its dimension (Efficiency)?

1.2 Research objectives

The study's objective is to understand the relationship between BCT and GP in MTP by determining whether the BCT's distinctive features are effectively appropriate to solve the MTP's main and current problems in governance and to identify the sector's main requirements. More specifically, the study aimed to accomplish the following.

1. Determine the impact of BCT of decentralization, transparency, and traceability on GP in MTP.

2. Analysis of the mediating impact of OE between BCT and the GP in MTP.
3. Propose a framework of BCT application and its impact on GP in MTP.
4. Diagnosing the impact of trends towards the application of BCT and their impact on the MTP (Positive effects).

2. Literature review

2.1 Blockchain technology – Decentralization

BCT is a decentralizing technique used in a network "peer-to-peer" to save transactional data, also referred as "blocks", for public database known as "distributed ledger" that is obtainable for running network participant (McGhin et al, 2019). Because of characteristics as Decentralization, Immutability, Protection, and Transparency, BTC is emerging as critical technological advancement of network communication (Ratta et al., 2021, Farhah, 2022). BC does not require any configuration for connection and synchronization nodes in a peer-to-peer manner, with built-in redundancies. It can tolerate many communication link failures, allow external users to transfer transactions to any node, and ensure that separate nodes will be captured in missed transactions (Righi et al., 2020, p. 4; Wang & Hsueh, 2024). However, the actual amount of decentralization varies substantially among BC applications, and there is currently no commonly agreed definition or assessment of decentralization (Lin et al., 2021; Zhang et al., 2022). BC's common advantage systems are generally considered to be decentralization that does not have a central authority. By storing data on its decentralized network, BC is eliminating a number of risks associated with having data stored centrally (Wu et al., 2019). In general terms, decentralization means that no entity has control over the entire process. It is one of the characteristics which make BCT so powerful and a fundamental distinguishing feature of BCT from traditional databases, where all records are stored centrally (Wu et al., 2019).

BC governance is essential for the successful execution of decentralization and an efficient growth of BC systems (Kiayias & Lazos, 2022). Thus, governance decentralization outlines the decentralization of ownership and decision-making authority on BC platforms, as well as how these powers are distributed among owners and participants. Pelt et al. (2021) offer a framework for investigating BC governance and governance decentralization. Chen et al. (2021) uses multiple proxies to measure governance decentralization. The usage of BC in the transportation sector is fairly extensive, since it is applied for a variety of operations (Callefi et al., 2021).

2.2 Blockchain technology – Transparency

Chod et al., (2020) identified BCT as providing advantageous favorable financial at a reduced signal-cost ability in role of BC to enhancing transparency. Zhang et al., (2022) discuss the impact of BCT on the strategic pricing of competitor retailers. Sedlmeir et al. (2022) discuss the challenges of BCT in the businesses and the public sector was bound by an inordinate level of transparency. Because BC's technology is not fully mature, it still has some security flaws and attacks, resulting in user privacy disclosure. Regarding the privacy leakage risk of BC, Li et al. (2020) demonstrate that hackers can deduce real transaction entry with up to 80% accuracy. Pun et al., (2021) consider the BC selection for combating deceptive counterfeits. Moreover, the use of BC is not without risks. For example, the data saved in the BC may be stolen and leaked if it is attacked by hackers (Zhang et al., 2022). There is an abstract reason why the transparency issue appears to be essential. Integration with performance, governance, and legacy systems are presumably issues that can be addressed incrementally by gradually expanding the system's range of processes and participants (Sedlmeir et al., 2021).

2.3 Blockchain technology – Traceability

Traceability systems allow manufacturers to identify the sources of safety, assess the scope of potential safety issues, reduce the production of unsafe or low-quality items, and reduce negative public relations. Investments in traceability systems pay off in terms of increased safety and quality, as well as reduced risk (Olsen & Borit 2018; Corallo et al., 2020; Qian et al., 2022, Farhah, 2022). BC is a technology capable of improving transparency. This solution can create a flow of immutable data that any consumer can consult (Varavallo et al., 2022). BC ensures traceability and non-tampering, allowing it to record data invocation, hold people accountable effectively and accurately when data leakage occurs, and create an excellent natural system for government affairs (Lin et al., 2022). BC networks' security features, which can help improve the level of transparency, and trust through their members (Singh, 2022). As a result, BC Technologies requires a good traceability platform that ensures a simple and consistent flow of information. Furthermore,

tracking defective parts can help reduce rework and resource consumption (Saberi et al., 2019). Traditional traceability systems involve central control, and terminal users are isolated each other. As a result, there are disadvantages such as low transparency of traceability information, a limited government regulatory power, and easy data manipulation (Liu et al., 2022). Recent studies into traceability systems have focused on operating mechanisms, consumer perceptions (Rodriguez-Salvador & Dopico, 2020; Fernando et al., 2022), traceability modeling (Zhao et al., 2020; Brandín, & Abrishami 2021), system development (Sheel & Nath, 2019; Thakur et al. 2020; Asokan et al. 2022).

2.4 Operational efficiency

OE is a measure that demonstrates a business's strengths and weaknesses, as well as its ability to perform a variety of tasks in support of its own objectives using resources. The goal of efficiency is to apply the right thing in order to maximize benefits and reaching the organization's goals (Rakkarnsil & Butsalee, 2022). Businesses are concentrating on OE as a performance system that may have functioned well prior to the pandemic's difficulty. A performance system focused on OE, however, has an influence on organizational behavior and leaves businesses exposed to this issue (Vaara & Lamberg, 2016). According to the OE literature review, the total asset turnover ratio, fixed asset turnover rate, and inventory turnover rate are some of its components (Bui & Nguyen, 2021; Butsalee & Sincharoonsak, 2021; Chantapet et al., 2021). Efficiency concerns "doing things right" (Drucker, 1974). Operational performance relates to speed, flexibility, cost, or quality (Gonzalez-Benito, 2005). Operational effectiveness - as defined by some authors (Mithas et al., 2011) - may be particularly influenced by trust for a variety of reasons. To distinguish between "effectiveness" and "efficiency", the term "OE" is used across this paper.

2.5 The ministry of transport in Palestine & governance performance

The Palestinian ministry of transportation was established in 1994 with the aim of developing and regulating policies for the transportation sector in Palestine. The Ministry sought to bring about an integration between the means of land, air, and sea transport, and to develop the necessary infrastructure for the development of the Palestinian economy. The existence of an effective Palestinian transportation system is the main pillar of economic and social development, as it achieves connectivity and communication between Palestinian areas and all residential communities, enhances development and investment opportunities, and facilitates the movement of people, goods, and equipment to and from Palestine, thereby reducing cost and time. MTP is having 13 governorates with the aim of providing services to Palestinian citizens (MOT, 2016). The term "governance" has grown common since the 1980s, and it has expanded quickly both because changing social theories have encouraged individuals to understand the world in new ways and because the world has changed. Governance varies from the government in that it focuses on social practices and activities rather than the state and its institutions (Bevir, 2012). According to the World Bank (2020, p. 1), governance includes "the process by which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies; and the respect of citizens and the state for the institutions that govern economic and social interactions among them". As a result, governance has an impact on procedures and outcomes on a variety of political and economic levels. It is often assumed that governance performance, which is critical for economic growth, is divided into two groups. First, the impact of human capital in economic growth might be significantly influenced by governance performance. The impact of a country's governance performance on elements of production, such as human capital accumulation, has an impact on the growth environment and process (Mose, 2021). Second, the success of good governance, which places importance on regulatory quality, public-sector efficiency, and effective anti-corruption instruments, might create a viable corporate framework that promotes economic growth. In addition, the link between good governance and economic growth has been demonstrated in a number of regions (Al-Saadi & Khudari, 2020; Mahmood, 2021). However, BC governance also refers to two distinct dimensions: off-chain governance vs on-chain governance (Fischer & Valiente, 2021; Jin, 2024).

2.6 Conceptual framework

Figure 1 depicts the theoretical framework constructed after a thorough assessment of the literature on BCT, GP, and OE.

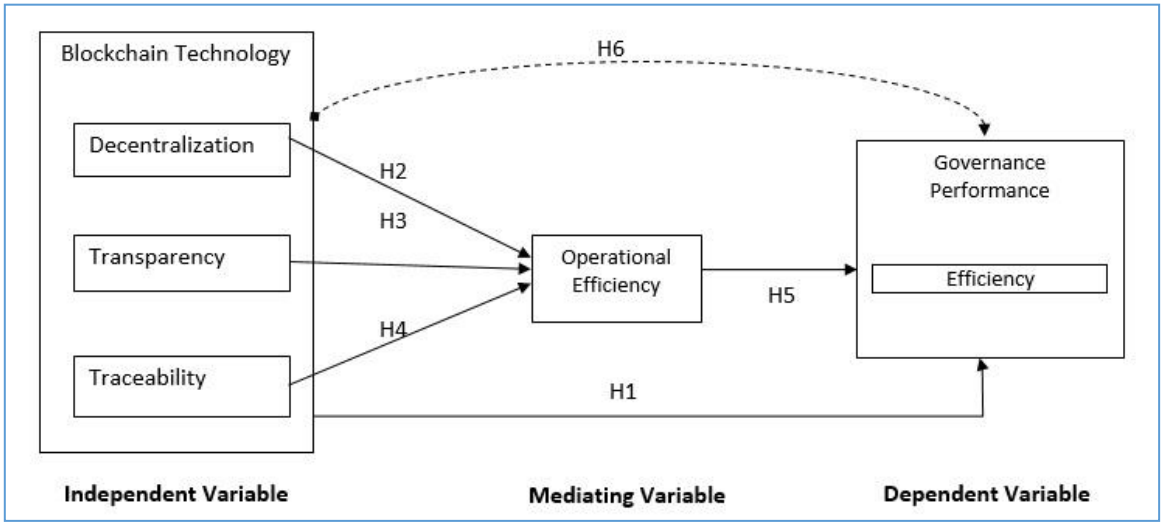

Fig. 1. A Conceptual Framework of BCT Application and its impact on GP

2.7 Research hypotheses

Based on the research problem, the question related to the research, and the research objectives, the researcher extracts the following set of hypotheses:

H1: BCT has an impact on the governance performance of the MTP.

H2: Decentralization has an impact on OE.

H3: Transparency has an impact on OE.

H4: Traceability has an impact on OE.

H5: OE has an impact on the GP of the MTP.

H6: OE mediates the relationship between BCT and GP of the MTP.

3. Methodology of the study

In the current study a survey research design was as a valuable tool for studying. Other studies were conducted as Gill et al. (2022), Elliot et al. (2021), Albayati et al. (2020), and Maingi (2019 used the same research design. For 29 specific questions, this survey employs five measurement scales "5-point Likert", ranging from (strongly disagree) to (strongly agree). In addition, this study included six demographic questions to identify the criteria that used self-administered questionnaires distributed in offices using the drop-off and collect technique. According to research, this technique is suitable for extensive questionnaires and can minimize non-response errors (Hair et al., 2003). The current study's unit of research was MTP senior, middle, and operational management employees, and a study population consists of (110) participants acquired from MTP as supplied by MTP (2021). The current study applied a simple random & stratified sampling technique, it gives survey respondents have an equal chance, and enables researchers to assign or distribute a study sample without bias. The study sample size was determined using Krejcie and Morgan's (1970) table. The demographic information for the respondents, Males made up (83.3%) of the data collected, while females made up only (16.7%). Furthermore, the results indicate that the largest proportion of the study sample members working in the transportation sector in Palestine have 5-8 years of experience, and their percentage is 33.3%. The age of respondents was mostly between 37-47 years (42.2). Furthermore, (96.7%) of respondents had a bachelor's degree. The results show that most of the workers in the transportation sector in Palestine who were included in a study sample work in the operational management with a percentage of 45.6% and 32.2% work in the middle management, while 22.2% work in the senior management. This result shows the impact of the organizational structure of the ministry of transport and the role of the operational management in carrying out tasks and its great relationship with other managements according to the hierarchy of jobs and the tasks assigned to each management. With regard to the departments by respondents, the results show that 11.1% of respondents are in the operations department, 8.9% in the traffic control department, and 7.8% in IT and administrative Affairs.

This study's response rate is satisfactory according to Hair et al. (2010). There were no missing data or outliers following data cleaning and screening; hence, the study was completed with 90 valid, achieving a response rate of 81.81% for the final selection of study participants. Additionally, preliminary analysis was performed to test the research's developed hypotheses by using the SPSS (26.0), and Smart-PLS (3.3.3). The study tool - questionnaire is divided into 2 parts. The part-1 of the questionnaire covers the demographic information about the research participants, and the part-2 has the measurement items for the study variables. The part-2 contains (As shown in table 1) three variables in this study, containing 29 measurement items; BCT was assessed for 20 adapted items. 5 adapted items were used to assess OE, while 4 adapted items were used to assess GP. On a 5-point Likert scale, all items were scored (Vagias, 2006) and Pilot test was conducted in which the research instrument's validity and reliability were tested. Regarding validity, 11 academic and industry experts were chosen to confirm the instrument's validity, which included the relevance of the clause, clarity of language, and communication (Straub, 1989). Reliability (internal consistency) was further tested using Cronbach's Alpha (α) reliability with 13 randomly selected employees who have comparable characteristics and are not among the intended population (Johanson and Brooks, 2010). Cronbach's α for all was "0.95", whereas BCT was .96, Cronbach's α was .87 for OE and 0.80 for GP. Alpha results are more than "0.70", demonstrating that the instruments are accurate (Hair et al., 2010).

4. Data analysis

The study hypotheses were analyzed using PLS-SEM by SmartPLS (V.3.3.3). Therefore, both the measurement and structural-models are evaluated in the following sections.

4.1 Measurement model

The validity and reliability of the measurements were determined by analysis. The measurement model's convergent validity was explained in Table (1). Items with factor loading < 0.60, according to Hair et al. (2006), should be deleted. Furthermore, any item having factor loading of less than "0.40" must be deleted (Hair et al., 2012). As can be seen in Figure (2) and Table (1), all factor loadings were accepted. According to Hair et al. (2012), the remaining factor loadings ranged from (0.707) to (0.892), exceeding the "0.40". In Table (1), all of AVE ranges (0.633-0.693), all higher than the permissible value "0.50", Hair et al. (2012) suggested. Alpha (α) and composite reliability (CR) must be measured in order to verify the reliability of convergent validity. The result demonstrated excellent internal consistency ranging (0.910-0.973), and the CR outcome has a suitable value ranging (0.873-0.975), which are both greater than the permissible value "0.70" depending on Hair et al (2016) proposed. DV (Discriminant Validity) was assessed for computing SR (Square Root) of the average variance extracted "AVE" (Hair et al., 2011). Indicated in Table (2), DV was computed using the Fornell and Laker (1981) technique, it's obtained. In connection with the diagonal values in bold font represent the square root of AVE, whereas the off diagonals represent the correlations. Square root of AVEs of the constructs is bigger than the correlations of the other constructs, according to the Fornell-Larcker's criterion (FLC) outcomes. As a result, all of the conditions for the measurement model DV were met. Booth tables (1 & 2) have been demonstrated DV and convergent of the current study.

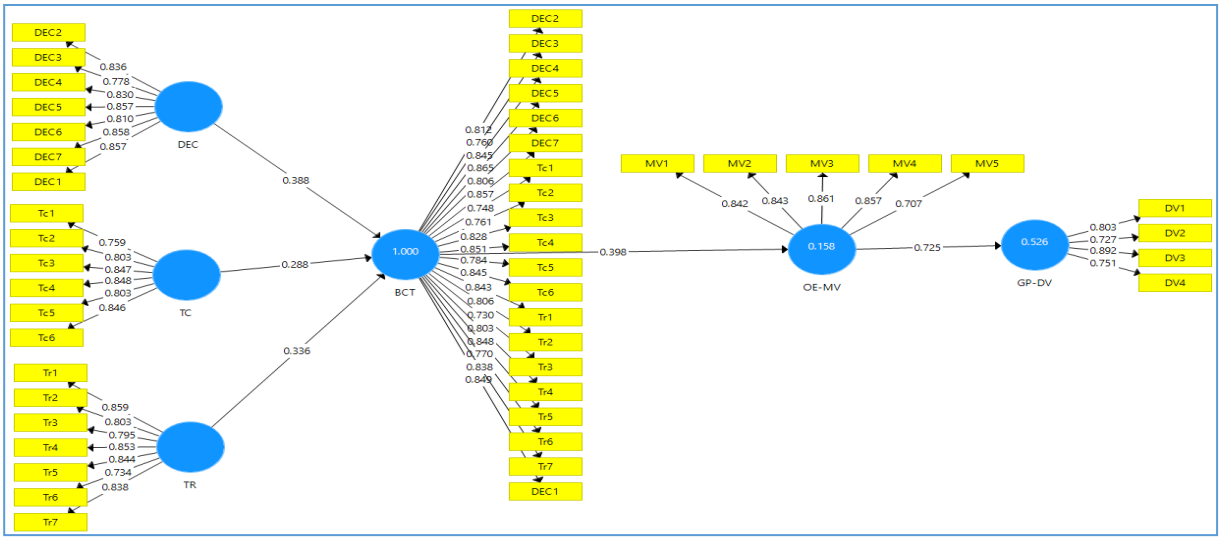

Fig. 2. Measurement-Model - Indirect Effect of BCT on GP

Table 1. Items loadings, composite reliability and average variance extracted, source: field survey (2021)

CONSTRUCTS	FACTOR LOADINGS	ALPHA(A)	COMPOSITE RELIABILITY	AVERAGE VARIANCE EXTRACTED	COUNT
BCT-DEC		0.926	0.941	0.693	7
DEC1	0.857				
DEC2	0.836				
DEC3	0.778				
DEC4	0.830				
DEC5	0.857				
DEC6	0.810				
DEC7	0.858				
BCT-TC		0.901	0.924	0.670	6
TC1	0.759				
TC2	0.803				
TC3	0.847				
TC4	0.848				
TC5	0.803				
TC6	0.846				
BCT-TR		0.918	0.934	0.671	7
TR1	0.859				
TR2	0.803				
TR3	0.795				
TR4	0.853				
TR5	0.844				
TR6	0.734				
TR7	0.838				
BCT		0.973	0.975	0.662	20
OE-MV		0.880	0.913	0.679	5
MV1	0.842				
MV2	0.843				
MV3	0.861				
MV4	0.857				
MV5	0.707				
DV		0.806	0.873	0.633	4
DV1	0.803				
DV2	0.727				
DV3	0.892				
DV4	0.751				
All		α=.958			29

Table 2. Results of discriminant validity (Fornell-Larcker Method) & VIF

	BCT	BCT-DEC	BCT-TC	BCT-TR	GP-DV	OE-MV	VIF
BCT	0.813						
BCT-DEC	0.795	0.833					1.896
BCT-TC	0.783	0.772	0.818				1.455
BCT-TR	0.685	0.773	0.745	0.819			1.529

	BCT	BCT-DEC	BCT-TC	BCT-TR	GP-DV	OE-MV	VIF
GP-DV	0.330	0.334	0.340	0.301	0.796		-
OE-MV	0.398	0.408	0.375	0.388	0.725	0.824	1.755

Note: BCT =Blockchain Technology; DEC = Decentralization; TC = Transparency; TR = Traceability; GP-DV =Governance Performance; OE-MV =Operational efficiency.

4.2 Structural model

The predictors' collinearity was assessed and is not a concern because all VIF are considerably less than 5 as recomended by Hair et al. (2013) (see Table (2)). We assessed R^2 to calculate the structural-models' coefficient of determination. According to Hair et al., 2013, R^2 demonstrated how much exists in the independent variable according. Depending on figure (3), OE and GP R^2 values from the PLS algorithm were 0.158 and 0.526, respectively, indicating moderate explanatory strength (Chin, 1998). Following the blindfolding process (Hair et al., 2013), Q^2 values for OE (0.101) and GP (0.314) are greater than zero, indicating that it has acceptable predictive significance. A path estimates and t-statistics for the hypothesized relationships were calculated using a bootstrapping technique with 5000 re-samplings. The structural-model was analyzed in Figure (3) and Table (3), BCT: T-Value = (3.250), ($P \leq 0.01$),β =(0.398) have an important and substantial impact on OE. Following that, we examined OE mediating effect on GP relationships. The bootstrapping method was applied for examine an indirect effect as specified in the literature. Table (3) showed that an indirect effect values T-Value = (13.237), $P \leq 0.01$), β = (0.725) was substantial, there was a mediating impact. VAF compares the magnitude of indirect impact to the total effect. This study examined the VAF, and the results are as follows, according to Hair et al. (2013), who classified VAF of = 20% - 80% as partial mediation and > 80% as full mediation.

I. There is a fully mediating-role for OE in the impact of Decentralization on GP at ($\alpha \leq 0.05$). Where the value of the VAF was (0.852).

II. There is a partial mediating-role for OE in the impact of Transparency on GP at ($\alpha \leq 0.05$). Where the value of the VAF was (0.741).

III. There is a fully mediating-role for OE in the impact of Traceability on GP at ($\alpha \leq 0.05$). Where the value of the VAF was (0.916).

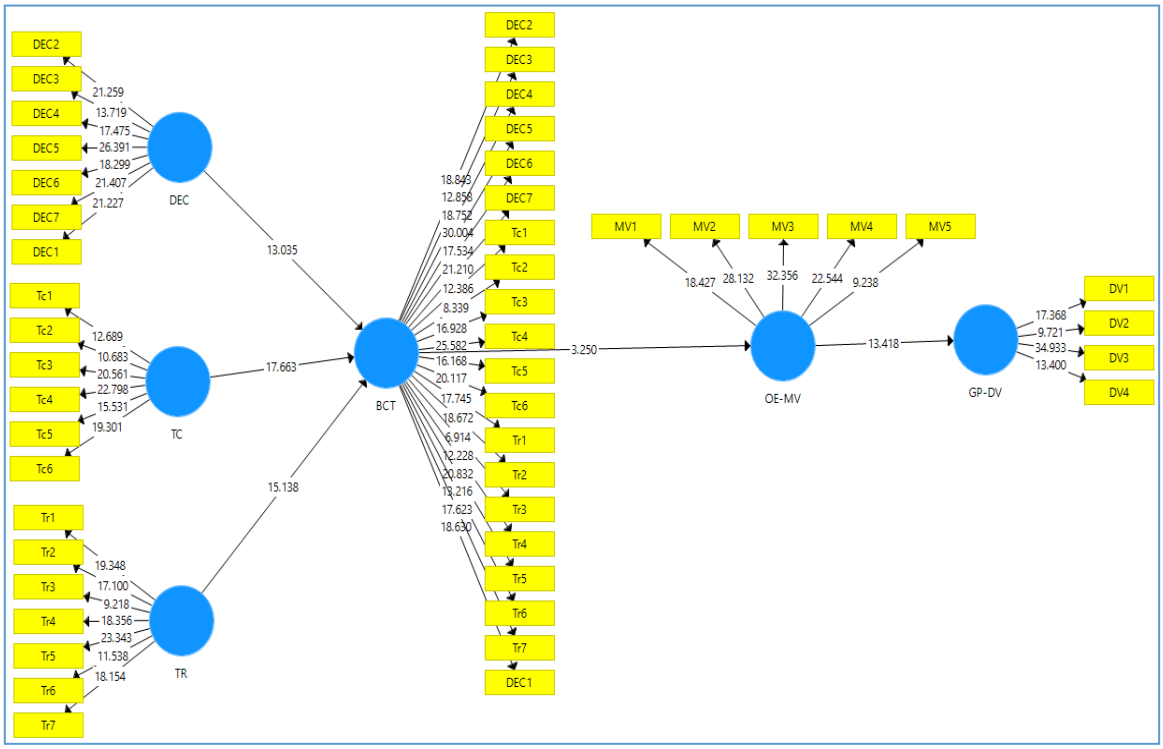

Fig. 3. PLS-SEM Bootstrapping

Table 3. Structural path model effects

HYPOTHESIZED-PATH	PATH-COEFFICIENTS	STD. ERRORS	T-VALUES	P-VALUES	RESULTS
BCT -> GP-DV	0.289	0.093	3.092**	0.002	Supported
BCT -> OE-MV	0.398	0.122	3.250***	0.001	Supported
BCT-DEC -> BCT	0.388	0.029	13.165***	0.000	Supported
BCT-DEC -> GP-DV	0.112	0.038	2.931**	0.003	Supported
BCT-DEC -> OE-MV	0.154	0.051	3.014**	0.003	Supported
BCT TC -> BCT	0.288	0.016	17.666***	0.000	Supported
BCT TC -> GP-DV	0.083	0.027	3.075***	0.002	Supported
BCT TC -> OE-MV	0.115	0.035	3.284**	0.001	Supported
BCT TR -> BCT	0.336	0.022	15.131***	0.000	Supported
BCT_TR -> GP-DV	0.097	0.031	3.131***	0.002	Supported
BCT_TR -> OE-MV	0.134	0.040	3.315**	0.001	Supported
OE-MV -> GP-DV	0.725	0.055	13.237***	0.000	Supported

Notes: ***P≤0.001; **P≤0.01; *P≤0.05; BCT = Blockchain Technology; DEC = Decentralization; TC = Transparency; TR = Traceability; GP-DV =Governance Performance; OE-MV =Operational efficiency.

4.3 Discussion

The BCT has a significant impact on GP due to its distinctive dimensions (Decentralization, Transparency, and Traceability). According to the findings, BCT has a significant effect on GP in Table (3) and Figure (3). About the results, BCT is a significant factor that has an effect on MTP's GP efficiency. The results of the analysis showed that the BC came in a high degree, with the mean for BCT with its dimensions (Decentralization, Transparency, and Traceability) ranging between (3.95 and 4.03), where the variable had a total mean (3.9835) and a total standard deviation (. 68480), which is of a high level, where was the indicator (Traceability) has the highest mean (4.03), and standard deviation (. 687), which is from the high level. Next, the indicator (Decentralization) has a mean (3.96), and standard deviation (. 702), which is a high level. In contrast, the indicator (Transparency) has the lowest mean (3.95), and standard deviation (. 690), which is the high level. As a consequence, MTP must create corporate settings that are more suited to their organizational structure and environment, and it also has to build core principles that go well with the institutional setting. In order to enhance GP, BCT acts as a catalyst. The results showed that the transparency in BCT came to a high degree from the point of view of study sample members. This explains that for all participants, this technology ensures transparency. BCT creates a unique level of trust, which contributes to a more sustainable industry, due to the irreversible method of storing data. BCT provides a feasible alternative to the standard traceability system's centralized storage mode and its associated limitations (Qian et al., 2022; Wu et al., 2019). According to the traceability in BCT came to a high degree from the point of view of study sample members. The OE mediates the relationship between the BCT and the GP. Therefore in current study, BCT is a strong predictor of GP, and OE plays an important role in enhancing the efficiency of GP. This study indicate that OE is highly associated with technology utilization, reflecting on OE, which was at a high level from the point of view of department of transportation employees, which explains that technology has a significant impact on improving services and creating new products and services that have an impact on users through OE. The findings of this study are influenced by the research of Hasan et al.(2020), and Yu et al.(2022). According to the findings, OE came to high degree from the point of view of study sample members. This explains that the findings reinforce the important position of the BCT on the GP. First, the BCT enhances the ministry's OE. Second, the BCT has an indirect effect on the GP through OE. Overall, the BCT and OE are strong predictors of GP. As a result, OE plays a mediator role between BCT and GP in MTP.

5. Conclusion

It focused on BCT and its impact on the GP at the MTP through the OE as a mediator. The study's findings indicated that BCT had a significant influence on GP. The results also demonstrated that OE mediates the interaction between BCT and GP. According to the relationship between BCT and GP in MTP, the study outcome indicated that OE, a fully mediating role in the impact of decentralization and traceability, and a partial mediating role in the impact of transparency on GP at a significant level ($\alpha \leq 0.05$). In

current study, BCT is an excellent predictor of GP, and OE plays an important role in improving GP efficiency. This study is the product of a rigorous scientific procedure, and the findings apply to the west bank, the senior, middle and operational management in those departments because they are primarily related to the subject of the study and are able to deal with the variables of the study, and the study was conducted in the transportation sector., particularly Palestine. Here, the importance of governance and automation to automate replicable functions and implement data-focused and up-to-date program statutes is evident, helping to reduce time spent on administrative work, reduce errors and increase efficiency (Zalnieriute et al., 2019; Kiayias and Lazos, 2022; Jin, 2024). As a result, the current study contributes to the body of knowledge in the highlighted topic by expanding previous literature on the interactions between BCT, OE, and GP. Our research is one of the first in MTP to bridge the gap and do such research. The results clearly demonstrated that BCT and OE are the most important and critical factors in actualized GP. Furthermore, we may conclude from such results that need to start using BC applications to improve the efficiency of services at MTP, with holding training programs and introductory workshops on the importance of BCT and its impact on various ministries. The findings of this study have important implications for MTP management. BC cannot prevent crime on its own. However, crucial application examples show how the technology may be used to solve weaknesses in existing systems. These application cases further emphasize the significance of a multifaceted approach to BC-based governance. They frequently indicate key limitations and downsides to the use of this unique technology. The advantages and disadvantages of BC-based governance systems must be carefully considered by governments, even though these restrictions may become less significant as technology advances. The administration of blockchains is inherently neither agnostic nor apolitical. Certain governance decisions are highlighted above others by design decisions made by system designers at the micro level or the power dynamics across the BC network. Recently, computer sciences, economics, and law have taken a greater interest in the governance of BC-based systems, but the literature is still in its early stages (Tan et al., 2022). This study makes a variety of theoretical and managerial contributions; nevertheless, it also has limits and provides suggestions for further research. It exclusively considers BCT as a predictor. Future research may examine more indicators, including immutability, automation, and risk reduction, while also introducing moderating variables such as legislation to significantly strengthen and developing our current-framework, which may increase the percentage of variance explanations. As a result, future research should extending the scope by considering a wide range of BC-based information systems that can be developed and implemented in various governance entities, as well as other sectors in Palestine and beyond, to provide a generalizable and comparative outcome.

References

- Albayati, H., Kim, S. K., & Rho, J. J. (2020). Accepting financial transactions using blockchain technology and cryptocurrency: A customer perspective approach. Technology in Society, 62, 101320.
- Asokan, D., Sunny, J., Pillai, V. M., & Nath, H. V. (2022). Blockchain technology: a troubleshooter for blood cold chains. Journal of Global Operations and Strategic Sourcing, 15(3), 316-344.
- Brandín, R., & Abrishami, S. (2021). Information traceability platforms for asset data lifecycle: blockchain-based technologies. Smart and Sustainable Built Environment, 10(3), 364-386.
- Butsalee, P., & Sincharoonsak, T. (2021). The Influence Of Intellectual Capital Efficiency Affecting Corporate Governance Competitive Advantage And Performance Of The Listed Companies Of The Stock Exchange Of Thailand. International Journal of Entrepreneurship, 25, 1-9.
- Callefi, M. H. B. M., Tavares, T. M., Ganga, G. M. D., & Godinho Filho, M. (2021). Blockchain-enabled capabilities in transport operations: an overview of the literature. Independent Journal of Management & Production, 12(9), s728-s740.
- Chen, Y., Richter, J. I., & Patel, P. C. (2021). Decentralized governance of digital platforms. Journal of Management, 47(5), 1305-1337.
- Chod, J., Trichakis, N., Tsoukalas, G., Aspegren, H., & Weber, M. (2020). On the financing benefits of supply chain transparency and blockchain adoption. Management science, 66(10), 4378-4396.
- Corallo, A., Latino, M. E., Menegoli, M., & Striani, F. (2020). The awareness assessment of the Italian agri-food industry regarding food traceability systems. Trends in Food Science & Technology, 101, 28-37.
- Elliot, V., Floden, J., Overland, C., Raza, Z., Staron, M., Woxenius, J., ... & Stefansson, G. (2021). CEOs' understanding of blockchain technology and its adoption in export-oriented companies in West Sweden: a survey. Journal of Global Operations and Strategic Sourcing.
- Emory, K., Douma, F., & Cao, J. (2022). Autonomous vehicle policies with equity implications: Patterns and gaps. Transportation Research Interdisciplinary Perspectives, 13, 100521.
- Farhah, M. F. A. (2022). The blockchain: The next technological revolution in the world of the economy. Journal of Economic, Administrative and Legal Sciences, 6(15), 119–140. https://doi.org/10.26389/AJSRP.F260122

- Fernando, Y., Wahyuni-TD, I. S., Zainul Abideen, A., & Mergeresa, F. (2023). Traceability technology, halal logistics brand and logistics performance: religious beliefs and beyond. Journal of Islamic Marketing, 14(4), 1007-1031.
- Fischer, A., & Valiente, M. C. (2021). Blockchain governance. Internet Policy Review, 10(2), 1-10.
- Fornell, C. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics.
- Gill, A., Kang, P., & Amiraslany, A. (2023). Information technology investment and working capital management efficiency: evidence from India survey data. South Asian Journal of Business Studies, 12(4), 559-574.
- González-Benito, J. (2005). A study of the effect of manufacturing proactivity on business performance. International Journal of Operations & Production Management, 25(3), 222-241.
- Gumbo, T., Moyo, T., Ndwandwe, B., Risimati, B., & Mbatha, S. G. (2022). Urban Public Transport Systems Innovations in the Era of the Fourth Industrial Revolution: Perspectives, Reflections, and Conjectures. In Urban Public Transport Systems Innovation in the Fourth Industrial Revolution Era: Global South Perspectives, Reflections and Conjectures (pp. 3-24). Cham: Springer International Publishing.
- Hasan, M. R., Shiming, D., Islam, M. A., & Hossain, M. Z. (2020). Operational efficiency effects of blockchain technology implementation in firms: Evidence from China. Review of International Business and Strategy, 30(2), 163-181.
- Hastig, G. M., & Sodhi, M. S. (2020). Blockchain for supply chain traceability: Business requirements and critical success factors. Production and Operations Management, 29(4), 935-954.
- Ivanov, D., Dolgui, A., & Sokolov, B. (2019). The impact of digital technology and Industry 4.0 on the ripple effect and supply chain risk analytics. International journal of production research, 57(3), 829-846.
- Jin, S. (2024). The Paradigm Logic of Blockchain Governance. Technology in Society, 102681.
- Kamble, S., Gunasekaran, A., & Arha, H. (2019). Understanding the Blockchain technology adoption in supply chains-Indian context. International Journal of Production Research, 57(7), 2009-2033.
- Kamilaris, A., Fonts, A., & Prenafeta-Boldύ, F. X. (2019). The rise of blockchain technology in agriculture and food supply chains. Trends in food science & technology, 91, 640-652.
- Kiayias, A., & Lazos, P. (2022, September). SoK: blockchain governance. In Proceedings of the 4th ACM Conference on Advances in Financial Technologies (pp. 61-73).
- Lezoche, M., Hernandez, J. E., Díaz, M. D. M. E. A., Panetto, H., & Kacprzyk, J. (2020). Agri-food 4.0: A survey of the supply chains and technologies for the future agriculture. Computers in industry, 117, 103187.
- Li, X., Jiang, P., Chen, T., Luo, X., & Wen, Q. (2020). A survey on the security of blockchain systems. Future generation computer systems, 107, 841-853.
- Lin, R., Wang, L., Li, B., Lu, Y., Qi, Z., & Xie, L. (2023). Organizational governance in the smart era: The implications of blockchain. Nankai Business Review International, 14(2), 197-229.
- Liu, P., Ren, S., Wang, J., Yuan, S., Nian, Y., & Li, Y. (2022). A Blockchain Consensus Optimization-Based Algorithm for Food Traceability. Mobile Information Systems, 2022(1), 1529983.
- Liu, W., Wang, J., Jia, F., & Choi, T. M. (2022). Blockchain announcements and stock value: a technology management perspective. International Journal of Operations & Production Management, 42(5), 713-742.
- Mahmood, H. (2021). Oil prices, control of corruption, governance, and economic growth nexus in Saudi Arabia. International Journal of Energy Economics and Policy, 11(4), 91-96.
- Maingi, S. W. (2019). Sustainable tourism certification, local governance and management in dealing with overtourism in East Africa. Worldwide Hospitality and Tourism Themes, 11(5), 532-551.
- McGhin, T., Choo, K. K. R., Liu, C. Z., & He, D. (2019). Blockchain in healthcare applications: Research challenges and opportunities. Journal of network and computer applications, 135, 62-75.
- Mithas, S., Ramasubbu, N., & Sambamurthy, V. (2011). How information management capability influences firm performance. MIS quarterly, 237-256.
- Mose, N. (2021). Determinants of regional economic growth in Kenya. African Journal of Business Management, 15(1), 1-12.
- MOT (2016), available at: https://www.mot.gov.ps/structure/.
- MOT (2019), Available at: http://www.mot.ps/ar/files/pdf/plans/plan_2019.
- MOT (2020), available at: http://www.mot.gov.ps/minister_speech/.
- MOT (2021), available at: https://library.palestineeconomy.ps/public/files/server/0-1629974548.pdf.
- Obaid, S., & Rabayaa, S. (2020). The degree of implementing governance rules in the public sector institutions in the West Bank. Al-Quds Open University for Administrative & Economic Research & Studies, 5(13). https://doi.org/10.33977/1760-005-013-002
- Olsen, P., & Borit, M. (2018). The components of a food traceability system. Trends in Food Science & Technology, 77, 143-149.

- Pelt, R. V., Jansen, S., Baars, D., & Overbeek, S. (2021). Defining blockchain governance: A framework for analysis and comparison. Information Systems Management, 38(1), 21-41.
- Pun, H., Swaminathan, J. M., & Hou, P. (2021). Blockchain adoption for combating deceptive counterfeits. Production and Operations Management, 30(4), 864-882.
- Qian, J., Dai, B., Wang, B., Zha, Y., & Song, Q. (2022). Traceability in food processing: Problems, methods, and performance evaluations—A review. Critical Reviews in Food Science and Nutrition, 62(3), 679-692.
- Rakkarnsil, S., & Butsalee, P. (2022). The influence of corporate governance and profitability affecting operational efficiency of the listed companies of the stock exchange of Thailand. International journal of economics and finance studies, 14(1), 259-284.
- Rakkarnsil, S., & Butsalee, P. (2022). The influence of corporate governance and profitability affecting operational efficiency of the listed companies of the stock exchange of Thailand. International journal of economics and finance studies, 14(1), 259-284.
- Ratta, P., Kaur, A., Sharma, S., Shabaz, M., & Dhiman, G. (2021). Application of blockchain and internet of things in healthcare and medical sector: applications, challenges, and future perspectives. Journal of Food Quality, 2021(1), 7608296.
- Rodriguez-Salvador, B., & Dopico, D. C. (2020). Understanding the value of traceability of fishery products from a consumer perspective. Food Control, 112, 107142.
- 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.
- Sedlmeir, J., Lautenschlager, J., Fridgen, G., & Urbach, N. (2022). The transparency challenge of blockchain in organizations. Electronic Markets, 32(3), 1779-1794.
- Sedlmeir, J., Ross, P., Luckow, A., Lockl, J., Miehle, D., & Fridgen, G. (2021). The DLPS: a new framework for benchmarking blockchains. In 54th Hawaii International Conference on System Sciences.
- Sheel, A., & Nath, V. (2019). Effect of blockchain technology adoption on supply chain adaptability, agility, alignment and performance. Management Research Review, 42(12), 1353-1374.
- Tan, E., Mahula, S., & Crompvoets, J. (2022). Blockchain governance in the public sector: A conceptual framework for public management. Government Information Quarterly, 39(1), 101625.
- Vaara, E., & Lamberg, J. A. (2016). Taking historical embeddedness seriously: Three historical approaches to advance strategy process and practice research. Academy of Management Review, 41(4), 633-657.
- van Hoek, R. (2020). Developing a framework for considering blockchain pilots in the supply chain–lessons from early industry adopters. Supply Chain Management: An International Journal, 25(1), 115-121.
- Varavallo, G., Caragnano, G., Bertone, F., Vernetti-Prot, L., & Terzo, O. (2022). Traceability platform based on green blockchain: an application case study in dairy supply chain. Sustainability, 14(6), 3321.
- Wang, Y. X., & Hsueh, Y. L. (2024). A low-storage synchronization framework for blockchain systems. Journal of Network and Computer Applications, 103977.
- Wang, Y., Singgih, M., Wang, J., & Rit, M. (2019). Making sense of blockchain technology: How will it transform supply chains?. International Journal of Production Economics, 211, 221-236.
- Wu, K., Peng, B., Xie, H., & Huang, Z. (2019, July). An information entropy method to quantify the degrees of decentralization for blockchain systems. In 2019 IEEE 9th International Conference on Electronics Information and Emergency Communication (ICEIEC) (pp. 1-6). IEEE.
- Yadav, S., & Singh, S. P. (2020). Blockchain critical success factors for sustainable supply chain. Resources, Conservation and Recycling, 152, 104505.
- Yu, Z., Khan, S. A. R., & Umar, M. (2022). Circular economy practices and industry 4.0 technologies: A strategic move of automobile industry. Business Strategy and the Environment, 31(3), 796-809.
- Zalnieriute, M., Moses, L. B., & Williams, G. (2019). The rule of law and automation of government decision-making. The Modern Law Review, 82(3), 425-455.
- Zhang, L., Ma, X., & Liu, Y. (2022). Sok: blockchain decentralization. arXiv preprint arXiv:2205.04256.
- Zhang, Z., Ren, D., Lan, Y., & Yang, S. (2022). Price competition and blockchain adoption in retailing markets. European Journal of Operational Research, 300(2), 647-660.
- Zhao, H., Wang, F., & Yang, Q. (2020). Origin traceability of peanut kernels based on multi-element fingerprinting combined with multivariate data analysis. Journal of the Science of Food and Agriculture, 100(10), 4040-4048.