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Article

Towards a comprehensive understanding of blockchain technology adoption in various industries in developing and emerging economies: a systematic review

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Towards a comprehensive understanding of blockchain technology adoption in various industries in developing and emerging economies: a systematic review

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ABSTRACT

The fast growth and wide range of applications of blockchain (BC) technology in various industries is irrefutable. Generally, BC technology is still in at an infant stage but it has generated significant interests in many sectors and industries. Nonetheless, despite an uptake of interest on the application of BC technology, the extent of its adoption in various industries in many countries remains partially understood. This paper aims to assess the current status of research on adoption of BC technology in various industries, particularly in developing and emerging economies. This study systematically reviewed the applied theories and models, adoption factors considered in each study, benefits, barriers and challenges of BC adoption intention in different industries from 86 articles published in the past five years from 2019 to end of June 2023. Findings showed several popular adoption models such as the Technology Acceptance Model, Unified Theory of Acceptance and Use of Technology and Task Technology Fit in the reviewed articles. Benefits, barriers and challenges were evident from each of the industries, implying the need to further understand BC adoption and application in these industries. This review also identifies a few research gaps and provides recommendations for future researches.

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1. Introduction

Bitcoin, as cryptocurrency or decentralized digital money was the first application of blockchain (BC) technologies in 2009. It was actually invented in 2008 by an unknown person or group of people using the pseudonym, Satoshi Nakamoto who published a white paper entitled 'Bitcoin: A Peer-to-Peer Electronic Cash System' (Aysan et al., 2021; Nakamoto, 2008). The advancement of the technology led to greater utilization of BC in many sectors and industries besides banking and finance. BC is also transforming numerous business applications as organizations across the industries tap on the various characteristics of BC such as decentralization, transparency, immutability, secure data storage system and ability to provide greater trust as well making zero exchange transaction available without the need for

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intermediaries in distributed applications (AL-Ashmori et al., 2022; Almekhlafi & Al-Shaibany, 2021; AlShamsi et al., 2022; Taherdoost, 2022). Enhanced security, cost savings, immutability, rapid transactions, transparency and pseudonymity are some of the strategic and operational benefits that BC technology may offer to its users (Javaid et al., 2021; Odeh et al., 2022; Saeed et al., 2022). Simply said, BC can be described as a distributed ledger network which depends on linked nodes that enable the exchange of data and transactions (Alam, 2022; Lynberg & Deif, 2023).

Modern BC applications cover a wide range of usage from low complexity such as cryptocurrency payments to more complex applications such as smart contracts. BC supply chain is capable of offering tracking functionality in an environment with high level of complexity. As the technology of BC continues to gain traction, large-scale public identification systems such as passport control and document authentication serve as some of the next revolutionary uses of BC technology (Gad et al., 2022; Gans et al., 2022; Haque et al., 2021). Due to that, this has generated more interest in the implementation of private BC research and development projects by large global financial organizations. Among others is the digital currency experimentation that include interbank transfer and replacement of manual and paper-based transactions (Hebert et al., 2023; World Bank Group, 2022).

Other than that, academics, politicians and practitioners are also showing more interest in BC technology adoption but it remains vague at present on how these transformational promises can be attained in reality. Despite the heightened interest on BC technology, its adoption in many industries is slow on the uptake and most endeavors are still at the early adoption stage. This may hamper the realization of BC technology application in reality because for any new technology to have a positive impact on society and the economy, it requires a lot of users and such usage must be broad and span over many industries (Berg et al., 2018). Thus, BC technology research should be able to provide insights on the adoption intention of users at the individual and organizational levels as well and offer glimpse of the qualities that boost or hinder its dispersion across society (Risius & Spohrer, 2017). In recent years, there have been many reviews on the adoption of BC technology in different industries such as education, banking and finance, healthcare, logistics and agriculture. These reviews provided some understanding about the benefits and challenges of BC technology adoption and adoption barriers. Benefits of BC technology include greater traceability efficiency, transparency in supply chain, better control of access to data, preservation of user privacy and identity authentication (Duan et al., 2020; Feng et al., 2020; Gurtu & Johny, 2019) while challenges are like scalability, immaturity of technology, legislative issues, potentials for cybercrime and lacking in interoperability (Loukil et al., 2021; Upadhyay et al., 2021; Vu et al., 2021; Zhao et al., 2019). Besides that, review of past studies indicated that research has also covered to some extent, the identification of adoption criteria derived from technology adoption theories and models (Taherdoost, 2022; Vu et al., 2021). However, these studies often concentrate on a single industry or sector and there is still a lacking of studies on factors that affect BC adoption in many other industries such as healthcare, agriculture and manufacturing. Filling this gap by extending a review of several industries makes a substantial contribution since it is critical to understand the current state of BC adoption in general and the lesson learnt from different industries so as to generalize the results. These industries were arbitrary selected in this review to provide a glimpse of industries that are more receptive to BC technology and those that are still undecided. Hence, this paper aims to provide a systematic review on the growing adoption of BC technology in various industries in developing and emerging economies. In this paper, we determine the current BC adoption status and review the literature coverage in the area of BC adoption, the extent that literature has covered on BC adoption in these industries, discover the factors that most influence BC adoption and identify the benefits, opportunities and barriers in adopting BC technology.

The remainder of this paper is organized as follows: [Section 2](#) discusses the related works, identifies the research gaps and presents the contribution of the study. [Section 3](#) introduces the research methodology and highlight the research questions. [Section 4](#) presents the results and discussion whereas [Section 5](#) presents the conclusions and recommendations. Finally, the practical implications and future directions are presented in [Section 6](#).

2. Related works

As the world transformed rapidly from Industrial Revolution 1.0 (IR1.0) to the current IR4.0, there has also been major upheaval in the use of state-of-the-art technologies such as artificial intelligence, Internet of

Things, machine learning, Cloud computing, 3D visualization and BC (Ahsan & Siddique, 2022; Sonkamble et al., 2021). Since its emergence in 2008 following the introduction of Bitcoin to the world, BC technology has shown potential benefits as was experienced in the banking and finance industries (Aysan et al., 2021). For instance, BC enables transparent auditing of transactions. Hence, in healthcare, BC could be employed to reduce burden in communication and computation of massive health and medical data (Ismail et al., 2019; Khatoon, 2020) whilst in education, BC can be employed for verifying certificates and degree, assessing students' performance, managing transfer of credit and assisting in student admission (Vidal et al., 2019). As shown in Table 1, BC application has benefited many industries with varied purposes and outcomes.

Despite the growing numbers of BC application, research on BC technology adoption, acceptance and readiness are asymmetrical in various industries. According to Agbo et al. (2019), there are indeed numerous uses of BC application in healthcare but there is a lacking in prototype implementation. Additionally, Fiore et al. (2023) further added that most research articles reported on simulation studies and providing theoretical-based information with lacking in real-life applications. A summary of five review articles on BC technology adoption in various industries as summarized in Table 2 implied that these papers were quite comprehensive in reporting various aspects such as adoption factors, benefits, challenges, models and theories and adoption barriers, but there are still identified gaps and aspects of the studies that have not been fully covered.

In recent years, there have been more adoption studies in various industries which could provide more information and filling the existing gaps of past studies. Hence, this current study provides a systematic and comprehensive analysis of BC technology adoption in the past five years from 2019 to 2023. As shown in Figure 1, an initial search from two databases, Science Direct and Google Scholar using keywords ('blockchain' OR 'block chain' OR 'blockchain technology') AND ('adoption' OR 'acceptance' OR 'application' OR 'usage' OR 'diffusion' OR 'intention to use' OR 'readiness') returned a search hit of articles published every year from 2019 to 2023. However, the number of articles searched from these two databases was only for the first six months of 2023, up to the end of June 2023, implying that the number of articles published in 2023 would be greater than 2022. It shows that the number of articles published within these last five years has progressively increased.

3. Methodological selection and research questions

This comprehensive review of the literature on BC technology adoption in various industries is supported by a solid process of a systematic analysis which include several steps such as definition of the problem, determination of the research goals and objectives, establishment of the inclusion and exclusion criteria, scanning of databases, manual searching and determination of eligibility via article screening (Alkawsii & Ali, 2018; Alkawsii et al., 2015; Baashar et al., 2016, 2020, 2021).

The initial step in systematic review is to determine the research problem which was done by exploring review articles on BC technology adoption and application in the past five years. This provides some ideas of identified research gaps and future scope of studies that could be addressed in the current study. As shown from the review of articles in the past five years, BC adoption is still considered at the infancy stage especially in developing and emerging countries. According to the International Monetary Fund (IMF) World Economic Outlook, 39 countries are categorized as 'advanced' economies while the remaining such as Brazil, Malaysia, China, India, Indonesia, Mexico, Russia, Saudi Arabia, Turkey and United Arab Emirates (UAE) are considered as emerging markets (IMF, 2021). Although there have been great achievements and reported success stories of BC applications in various fields, but these are mainly reported in developed countries. Not much is known yet on the diffusion of BC technology in developing and emerging countries and thus, implying a gap of knowledge that is addressed in this study.

3.1. Determination of the research questions

The second step in systematic review deals with the determination of the research questions which are aligned to the research objectives and based on the definition of the problem. Henceforth, the research questions posed for this study are:

Table 1. Blockchain technology application in various industries.

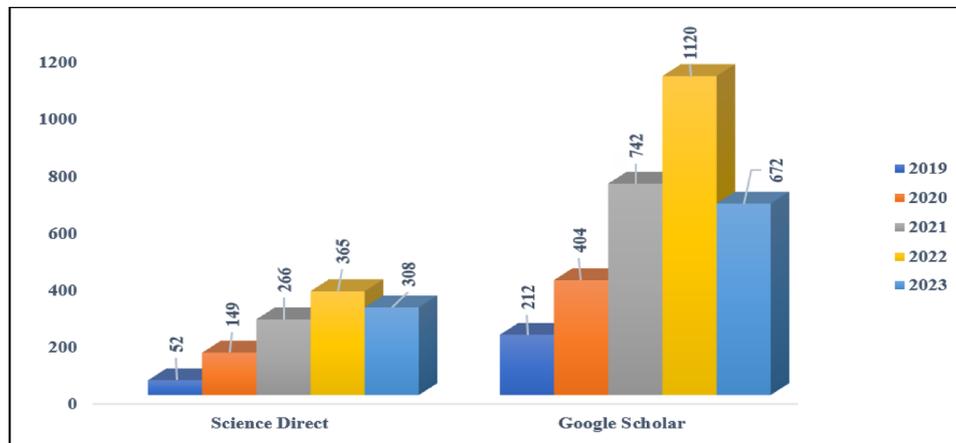
Industries/sectors	Application	Description	Sources
Logistics and transportation	La'Zooz, CoRide and FICA	Blockchain-based carpooling applications based on intelligent transport system (ITS) which are decentralized, anonymous, private and ride-sharing networks that are auditable and thus providing optimization of vacant seats and idle cargo spaces (Yong & Wang, 2016)	Çaldağ and Gökalp (2020)
	CarbonCount	A blockchain-based ITS application specifically used to calculate the individual carbon footprint using analyzed data on personal mobility	Lopez and Farooq (2018)
	Semi-Controlled Traffic Signal Control (SCTSC)	Support traffic signaling automation so that there is greater efficiency of the control and management of traffic	Cheng et al. (2019)
	Chorus Mobility	A decentralized system combining vehicular ad-hoc networks (VANET) and Ethereum for provision of services and enforcement of rules on smart transportation system	Leiding and Vorobev (2018)
Agriculture supply chain	BRUSCHETTA	An IoT blockchain-based framework to certify extra virgin olive oil supply chain	Arena et al. (2019)
	Food traceability solution	The use of blockchain, smart contract tokens and IoT in designing solution for food traceability	Kim et al. (2019)
	Traceability system for tea quality safety management	Use of blockchain in developing a traceability system to ensure quality safety management for tea	Liao and Xu (2019)
Education	Management of records	Blockchain is also used for managing academic degrees and summative results in a more effective manner	Skiba (2017)
	Management of online platform	Managing online courses, group meetings, presentation and research skills	Sharples and Domingue (2016)
	Managing online learning	Higher institutions like Nicosia university, Sony Global schooling and Holberton school are among those using blockchain for managing online learning	Skiba (2017) and Ullah et al. (2021)
Healthcare	Drugledger	The system provides information on drug ledger and the physical flow of drugs in the chain network of drugs	Konapure and Nawale (2022)
	Gcoin	Provides global control and changes the regulating role of drug supply chain system to inspection of drugs and surveillance	Almutairi et al. (2022)
	EMR management such as HealthChain, Ancile, MedRec, MedBlock, BlockHIE, FHIR and MedShare Secured Mobile Enabled Assisting Device (SMEAD)	Electronic medical record (EMR) for managing patients' health and personal records with assurance of confidentiality, scalability and security; An end-to-end secure system for monitoring patients with diabetes; Blockchain based medical insurance storage system as an initiative to resolve insurance claim in healthcare	Ahram et al. (2017), Dagher et al. (2018), Azaria et al. (2016), Fan et al. (2018), Jiang et al. (2018), Xia et al. (2017), Saravanan et al. (2017), Zhou et al. (2018) and Engelhardt (2017)
	MISStore and Pokitdok		

- RQ1: What are the influencing factors of BC technology adoption?
- RO2: What are the benefits, challenges and barriers concerning BC adoption and application in different industries?
- RO3: What are the current research gaps in adopting BC technology?

Table 2. Summary of reviews on blockchain technology adoption.

Article (year)	Period of publication	Number of articles	Industries	Aspects of BC adoption				
				1	2	3	4	5
Duan et al. (2020)	2008–2019	26	Supply Chain	x	✓	✓	x	x
Upadhyay et al. (2021)	2017–2021	71	Automotive	x	✓	✓	✓	x
Vu et al. (2021)	2009–2020	69	Supply Chain	~	x	x	~	✓
Loukil et al. (2021)	2016–2020	80	Education	x	✓	✓	x	x
Batubara et al. (2018)	2016–2017	21	e-government	x	x	x	x	x
Bazel et al. (2023)	2017–2022	12	Healthcare	✓	✓	~	✓	~

Note: Aspects: 1: adoption factors; 2: benefits; 3: challenges; 4: model/theory approach; 5: barriers to adoption; symbol: (✓) covered; (x) not covered; (~) partially covered;.

**Figure 1.** Initial search hits on Science Direct and Google Scholar for BC technology adoption and application in healthcare.**Table 3.** Inclusion and exclusion criteria.

Criteria	Description
Inclusion	<ul style="list-style-type: none"> Articles are published between 2019 and 2023 Contents focused on BC technology adoption, acceptance or readiness Articles is written in English
Exclusion	<ul style="list-style-type: none"> Articles published before 2019 Articles published in other languages besides the English language Contents is on BC application, principles and other aspects but not about adoption, acceptance and readiness.

3.2. Establishment of the exclusion and inclusion criteria

The online literature search was guided by a set of exclusion and inclusion criteria. These criteria as shown in Table 3, are necessary to guide the selection of papers that were assessed in this study.

3.3. Data search

The search and selection processes are guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) (Moher et al., 2009). The search on the four databases was carried out in the same day, which was on 28 June 2023. Data search was enabled by the use of keywords which include [(‘blockchain’ OR ‘blockchain technology’ OR ‘block chain’ OR ‘block-chain’) AND (‘adoption’ OR ‘acceptance’ OR ‘diffusion’ OR ‘intention to use’ OR ‘readiness’) AND (‘developing countries’ OR ‘emerging economies’)]. Besides the keywords, advanced search options were used to limit the search between 2019 and 2023, journal articles only, English language and limitation in terms of countries where articles were published. Choosing the appropriate keywords is necessary to ensure that the appropriate articles would be selected by the search engine in the database (Costa & Monteiro, 2016). Mendeley software

serves as a necessary tool to facilitate the recording, managing and deletion of duplicates from all the collected studies and citations. The studies were chosen based on two screening processes, including 'title/abstract' and 'full text' screenings. Databases such as Scopus, Science Direct, Google Scholars, IEEE Xplore and Taylors & Francis were included in the search to ensure an all-inclusive collection of research articles. Figure 2 shows the steps used in the screening and selection of the research articles. The final selection yielded a total of 81 articles to be included in the review.

4. Findings and discussion

4.1. Characteristics of the reviewed studies

A thorough and comprehensive search from the five databases yielded a total of 81 articles spread across a five-year period and spanning through 12 arbitrary industries and one group for a collection of miscellaneous articles which were not industry-specific. Table 4 illustrates the breakdown of the studies based on the year they were published and type of industries while Figure 3 present a more visual comparison of the studies in terms of industry type. In terms of publication, year 2021 recorded the highest hit with 25 articles while year 2020 showed the second highest hits with 20 articles, followed by 2022 with 16 hits. The total hits for 2019 was 10. For the first six months into the year 2023, there were only 10 articles available on these databases. Most of the articles were related to supply chain (22.2%), finance and banking (14.8%) and healthcare (11.1%).

As presented in Figure 4, most of the studies were conducted in Malaysia (n=17, 19.8%) and India (n=12, 14.0%) as well as from Jordan, China, Taiwan and Vietnam, each with 4 studies (4.7%), while Indonesia has 3 studies (3.5%). Other countries have either two or one studies each. Additionally, 22 studies (25.6%) did not specify their targeted countries.

As shown in Figure 5, the articles included in the review comprised mainly of empirical studies (n=64, 79.1%) while the remaining articles are conceptual paper (n=6, 7.4%), literature review (n=6, 7.4%) and case studies (n=4, 4.9%).

4.2. BC technology adoption factors

The influencing factors of BC technology adoption were governed by the underlying theories in these studies. The theories used include Technology Acceptance Model (TAM), Theory of Planned Behavior (TPB), Technology Readiness Index (TRI), Diffusion of Innovation (DOI), Unified Theory of Acceptance and Use of Technology (UTAUT), Technology, Organization and Environment (TOE) framework, Task Technology Fit (TTF), Fit-Viability model (FVM), Norm Activation Model (NAM), Connectivism theory, Information System Success (ISS) model, Stakeholder theory and Critical Success Factors (CSF) theory. In some articles,

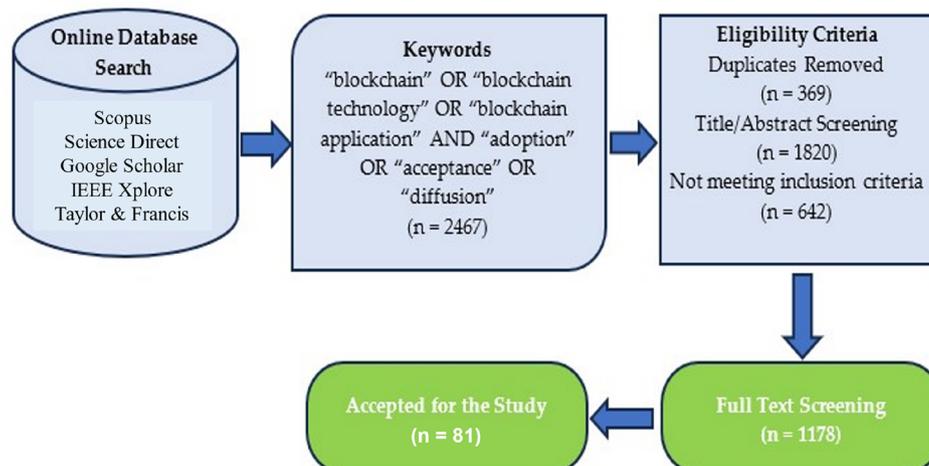
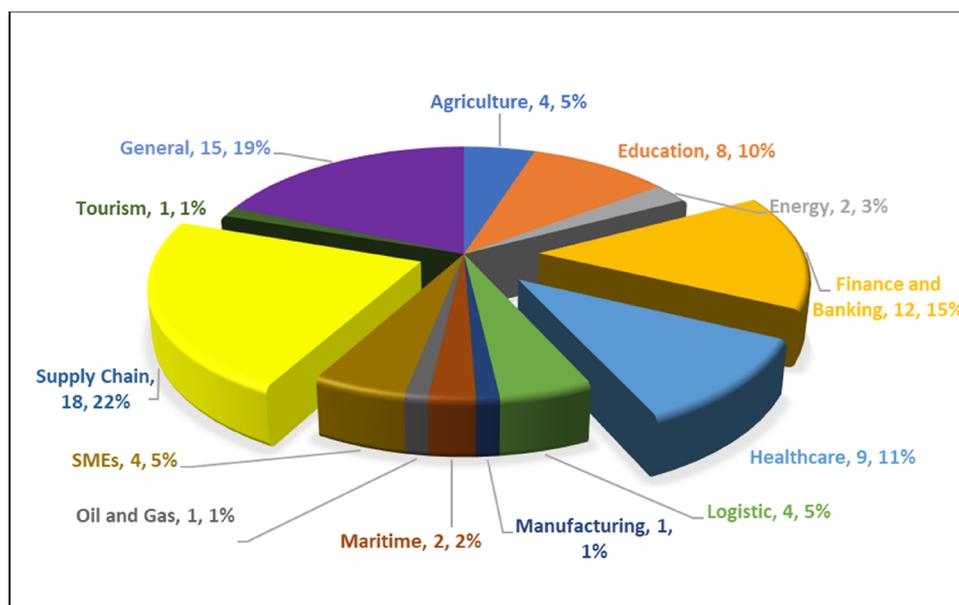


Figure 2. Screening and selection process.

Table 4. Classification of studies based on industries.

Industry	Year of publication					Total number of articles
	2019	2020	2021	2022	2023	
Agriculture	0	2	1	0	1	4
Education	1	2	3	1	1	8
Energy	0	1	0	1	0	2
Finance and banking	2	2	3	3	2	12
Healthcare	1	0	5	2	1	9
Logistics	0	1	0	1	2	4
Manufacturing	0	0	1	0	0	1
Maritime	1	0	1	0	0	2
Oil and gas	0	0	1	0	0	1
SMEs	1	1	1	0	1	4
Supply chain	2	7	3	5	1	18
Tourism	1	0	0	0	0	1
General	1	4	6	3	1	15
Total per year	10	20	25	16	10	81

**Figure 3.** Blockchain adoption studies according to industry type.

a single theory was used while in others, the theories were integrated and some were extended. [Table 5](#) summarizes the use of theories in these articles. As can be gleaned from the analysis, TAM, TOE, UTAUT and DOI are the most used theories across the industries. Other theories were like TTF was used in healthcare and supply chain while TRI was used in education, manufacturing and tourism. Besides that, TAM and DOI (education, energy and finance and banking industries) and DOI and TOE (healthcare, supply chain and general industries) appear to be the main choice of theory integration.

Popular theories such as TAM and UTAUT have defined variables to represent the predictors of usage intention. TAM used perceived usefulness (PU) and perceived ease of use (PEOU) as the antecedents of usage intention while UTAUT generally used expected expectancy (EEXP), expected performance (EPER), social influence (SOC) and facilitating condition (FC). On the other hand, TOE framework normally identifies factors classified under the domains of technology, organization and environment where some of these factors are regularly used to represent each domain such as relative advantages for technology, top management support for organization and pressure for environment. [Table 6](#) explores the use of TAM and UTAUT variables in the reviewed articles. Results presented in [Table 6](#) showed that PU and PEOU from TAM are always included in the research models of the reviewed articles. However, in Gao and Li (2021), PU was found to be an insignificant predictor of intention while PEOU was insignificantly related to BC usage intention in Iftikhar et al. (2021), Bhardwaj et al. (2021) and Nuryyev et al. (2020).

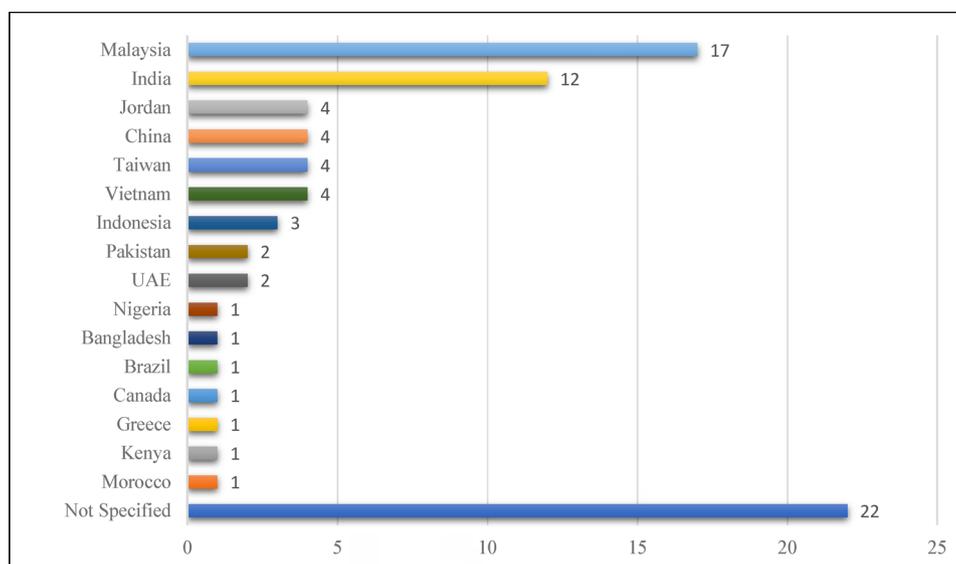


Figure 4. Distribution of studies based on countries.

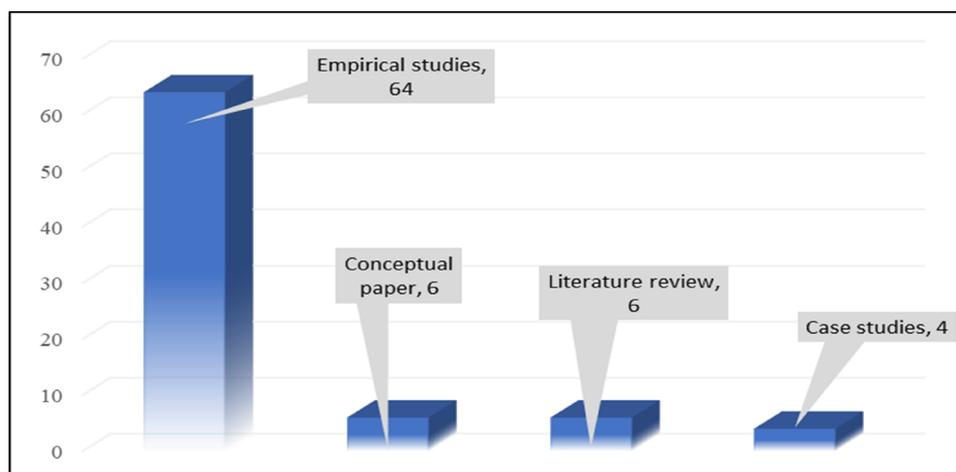


Figure 5. Type of articles.

Unlike TAM, UTAUT's not all variables are included in the studies all the time. Effort expectation was excluded in Nuryyev et al. (2020) and Kapnissis et al. (2022) and while expected performance was omitted in Nuryyev et al. (2020) and Khazaei (2020). Meanwhile, social influence was not included in Wong et al. (2020). Facilitating condition is often left out in the studies despite using UTAUT such as in Nuryyev et al. (2020), Kapnissis et al. (2022), Khazaei (2020), Abu Afifa et al. (2022) and Hira et al. (2022). Besides that, these variables are often found to be significant predictors of usage intention but expected expectancy was insignificant in Wong et al. (2020) and Latif and Zakaria (2020). As for expected performance, the insignificant result was indicated in Wong et al. (2020), Queiroz et al. (2020) and Wamba and Queiroz (2019). Social influence was an insignificant predictor of usage intention in Nuryyev et al. (2020) while facilitating condition was insignificant in Khazaei (2020).

Table 7 identifies the factors in each of TOE's three domains that were used in the reviewed articles. Technology domain of the TOE framework include popular factors such as relative advantage or comparative advantage, compatibility, complexity, perceived security and privacy, scalability and technology competence. In organizational context, most used factors are top management support, firm size, organizational readiness, perceived cost of investment, learning or organizational culture and technological knowledge and expertise. Cost was also included as a factor related to technology domain but in this case, it refers to the cost of using or implementing the technology. Meanwhile, for environmental

Table 5. Underlying theories used in the studies.

Theories	Usage	Usage in different industries													
		1	2	3	4	5	6	7	8	9	10	11	12	13	
TAM	27		✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓
TOE	18	✓	✓		✓	✓	✓				✓	✓			✓
UTAUT	18				✓	✓	✓					✓	✓	✓	✓
DOI	10		✓	✓	✓	✓					✓	✓	✓	✓	✓
TRI	5		✓		✓				✓				✓	✓	✓
TPB	5		✓		✓				✓						✓
TTF	5					✓					✓	✓			
NAM	2					✓									
FVM	1														✓
ISS	1											✓			
CSF model	1				✓										
Stakeholder theory	1				✓										
Connectivism theory	1												✓		
Extended TAM	2		✓												✓
Extended UTAUT	1			✓											
TAM and TPB	1		✓												
TAM and TOE	2		✓										✓		
TAM and TRI	2		✓												
TAM and DOI	3		✓	✓	✓										
TAM and TTF	1					✓									
TAM and UTAUT	1												✓		
TAM, TPB and TRI	2								✓						✓
TAM, TPB and UTAUT	1														✓
TAM, TOE and DOI	2										✓	✓			
TAM, TRA and UTAUT													✓		
UTAUT and NAM	2					✓									
UTAUT, TTF and ISS model	1											✓			
UTAUT and TOE	1											✓			
UTAUT and connectivism theory	1												✓		
DOI and TOE	3					✓							✓		✓
TOE, FVM, TTF, DOI, UTAUT and others	1														✓
Stakeholder theory and CSF model	1				✓										

Note: 1: agriculture; 2: education; 3: energy; 4: finance and banking; 5: healthcare; 6: logistics; 7: manufacturing; 8: maritime; 9: oil and gas; 10: SMEs; 11: supply chain; 12: tourism; 13: general.

Table 6. Use of TAM and UTAUT variables in the studies.

Theory	Factors	Referred articles													
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
TAM	PU	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
	PEOU	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
		15	16	17	18	19	20	21	22	23	24				
UTAUT	EEXP	☑	☑	☑	☒	☑	☑	☒	☑	☑	☒				
	EPER	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑				
	SOCI	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑				
	FC	☒	☑	☒	☒	☑	☒	☑	☑	☑	☒				

Note: ☑: used and significant predictor; ☒: use but insignificant predictor; ☒: not used in the study; 1: Altamimi et al. (2022); 2: Iftikhar et al. (2021); 3: Wan Muhamad et al. (2020); 4: Mat Razali et al. (2021); 5: Ullah et al. (2021); 6: Borhani et al. (2021); 7: Kabir and Islam (2021); 8: Soon (2019); 9: Kuberkar and Singhal (2021); 10 –Bhardwaj et al. (2021); 11: Gao and Li (2021); 12: Chengyue et al. (2021); 13: Knauer and Mann (2020); 14: Sciarelli et al. (2021); 15: Abu Afifa et al. (2022); 16: Latif and Zakaria (2020); 17: Hira et al. (2022); 18: Kapnissis et al. (2022); 19: L.-T. Nguyen et al. (2023); 20: Khazaei (2020); 21: Wamba and Queiroz (2019); 22: Queiroz et al. (2020); 23: Wahab et al. (2020); 24: Nuryyev et al. (2020).

context, most cited factors are competitive pressure, regulatory policies or regulatory uncertainties, government policy and support and market turbulence or market dynamic. Other factors were added to the three domains in TOE but these factors have not been extensively used in studies yet.

Besides TAM, UTAUT and TOE, other theories such as the TPB, TRI, TTF and NAM were also used in this study whereby their related factors were also used in the reviewed articles of this current study. For instance, TPB antecedents comprises of attitude, subjective norm, perceived behavioral control and self-efficacy. Besides that, the four factors of TRI, optimism, innovativeness, insecurity and discomfort were

Table 7. Identified factors of TOE framework in the studies.

Domains of TOE	Identified factors	Article source	
Technology	Relative advantage/comparative advantage	Agi and Jha (2022), Bhardwaj et al. (2021), Iftikhar et al. (2021), Kulkarni and Patil (2020), Lei (2022), Vu et al. (2022) and Wong et al. (2020)	
	Compatibility	Agi and Jha (2022), Bhardwaj et al. (2021), Fernando et al. (2021), Kulkarni and Patil (2020), Orji et al. (2020) and Vu et al. (2022)	
	Complexity	Agi and Jha (2022), Bhardwaj et al. (2021), Choi et al. (2020), Lu et al. (2021), Orji et al. (2020), Vu et al. (2022) and Wong et al. (2019)	
	Perceived security and privacy	Choi et al. (2020), Kulkarni and Patil (2020) and Orji et al. (2020)	
	Scalability concern	Choi et al. (2020) and Iftikhar et al. (2021)	
	Technology competence	Fernando et al. (2021) and Hader et al. (2020)	
	Cost	Choi et al. (2020) and Vu et al. (2022)	
	Interoperability	Dehghani et al. (2022)	
	Technological volatility	Dehghani et al. (2022)	
	Data quality	Abu Rumman and Al-Abbadi (2023) and Dehghani et al. (2022)	
	Specific BC tools availability	Orji et al. (2020)	
	Infrastructural facility	Orji et al. (2020)	
	Perceived benefits	Orji et al. (2020)	
	Technology readiness	Bhardwaj et al. (2021)	
	Maturity	Choi et al. (2020)	
	Ease of being tried and observed	Orji et al. (2020)	
	Organization	Top management support	Bhardwaj et al. (2021), Fernando et al. (2021), Hader et al. (2020), Iftikhar et al. (2021), Lu et al. (2021), Orji et al. (2020) and Wong et al. (2019)
		Firm scope/firm size	Fernando et al. (2021), Kulkarni and Patil (2020), Orji et al. (2020) and Vu et al. (2022)
		Organization readiness	Agi and Jha (2022), Lu et al. (2021) and Vu et al. (2022)
		Perceived cost of investment	Bhardwaj et al. (2021), Orji et al. (2020) and Wong et al. (2019)
Organizational culture		Kulkarni and Patil (2020) and Orji et al. (2020)	
Technological knowledge, expertise		Choi et al. (2020) and Dehghani et al. (2022)	
Corporate social responsibility		Lu et al. (2021)	
Presence of training facilities		Orji et al. (2020)	
Service quality		Lei (2022)	
Information quality		Lei (2022)	
Capability of human resources		Orji et al. (2020)	
Resources		Vu et al. (2022)	
Security		Bhardwaj et al. (2021)	
Technology awareness		Choi et al. (2020)	
Perceived risk of vendor lock-in		Choi et al. (2020)	
Perceived effort in collaboration		Choi et al. (2020)	
Innovativeness		Vu et al. (2022)	
Environment		Competitive pressure, trend of pressure	Fernando et al. (2021), Hader et al. (2020), Iftikhar et al. (2021), Kulkarni and Patil (2020), Lei (2022), Lu et al. (2021), Orji et al. (2020) and Wong et al. (2019)
		Regulatory policies/regulatory uncertainties	Bhardwaj et al. (2021), Dehghani et al. (2022), Iftikhar et al. (2021) and Vu et al. (2022)
		Government policy and support	Choi et al. (2020), Lu et al. (2021) and Orji et al. (2020)
	Market turbulence/market dynamic	Orji et al. (2020) and Wong et al. (2019)	
	Stakeholder pressure	Orji et al. (2020)	
	Vendor support	Bhardwaj et al. (2021)	
	Influence from consumer	Vu et al. (2022)	
	Influence from other organization	Vu et al. (2022)	
	Customer readiness	Kulkarni and Patil (2020)	
	Network enhancement	Dehghani et al. (2022)	
	Standardization uncertainty	Dehghani et al. (2022)	
	Individual innovativeness	Lei (2022)	
	Institutional-based trust	Orji et al. (2020)	
Perceived constraint of infrastructure	Choi et al. (2020)		

also included in some of the studies. Similarly, for TTF, factors related to this model were also used in Liang et al. (2021) and Prockl et al. (2022). In Hira et al. (2022), the study used NAM with three variables representing the model which are personal norm, ascription of responsibility and awareness of consequence. Trust is the most popular factor added in the research model to extend existing theories as indicated from the findings in Table 8. Other than that, BC technology adoption studies also include some characteristics of BC technology application too. Besides that, other factors that cannot be generalized to any theory or model were also listed to show the added factor in adoption studies that were reviewed.

The systematic review of articles from 2019 to 2023 as was done in this study showed that research in BC technology adoption and application has risen in numbers from developing and emerging

Table 8. Other adoption factors included in the studies.

Theoretical source	Factors	Referred articles
TPB	Attitude	Altamimi et al. (2022), Hao et al. (2020), Ullah et al. (2021) and Vu et al. (2022)
	Subjective norm	Gao and Li (2021) and Ullah et al. (2021)
	Perceived behavioural control	Ullah et al. (2021)
TRI	Computer self-efficacy	Abu Afifa et al. (2022)
	Optimism	Mat Razali et al. (2021), Wan Muhamad et al. (2020) and Ullah et al. (2021)
	Innovativeness	Chengyue et al. (2021), Khazaei (2020), Mat Razali et al. (2021), Ullah et al. (2021) and Wan Muhamad et al. (2020)
	Insecurity	Al-Faouri et al. (2023), Ullah et al. (2021) and Wan Muhamad et al. (2020)
Task technology fit	Discomfort	Mat Razali et al. (2021), Ullah et al. (2021) and Wan Muhamad et al. (2020)
	Data security	Liang et al. (2021)
	Data processing	Liang et al. (2021)
Norm activation model	Compatibility needs	Liang et al. (2021)
	Task-technology fit	Almasarweh et al. (2013), Hao et al. (2020) and Khazaei (2020)
	Personal norm	Hira et al. (2021)
Trust model	Ascription of responsibility	Hira et al. (2021)
	Awareness of consequence	Hira et al. (2021)
BC characteristics	Trust	Abu Afifa et al. (2022), Chengyue et al. (2021), Çolak and Kağrıciöğlü (2022), Fernando et al. (2021), Gao and Li (2021), Hafide et al. (2020), Hao et al. (2020), Hira et al. (2021), Jena (2022), Khazaei (2020), Latif and Zakaria (2020), Lu et al. (2021), H.-B. Nguyen and Nguyen (2021), Nuryyev et al. (2020), Queiroz et al. (2020), Saurabh and Dey (2021), Ullah et al. (2022) and Wong et al. (2020)
	Dis-intermediation	Rejeb et al. (2022) and Saurabh and Dey (2021)
	Traceability	Abu Rumman and Al-Abbadı (2023), Elhidaoui et al. (2022), Fernando et al. (2021), Pradana et al. (2023), Rejeb et al. (2022) and Saurabh and Dey (2021)
	Coordination/control	Saurabh and Dey (2021)
	Compliance	Saurabh and Dey (2021)
	Perceived convenience	Altamimi et al. (2022)
	Trialability	Knauer and Mann (2020), Soon (2019) and Ullah et al. (2021)
	Timeliness	Borhani et al. (2021)
	Impartiality	Borhani et al. (2021)
	Verifiability	Borhani et al. (2021)
	Error free	Borhani et al. (2021)
	Observability/visibility	Fernando et al. (2021) and Soon (2019)
	Immutability	Fernando et al. (2021) and Rejeb et al. (2022)
	Decentralization	Rejeb et al. (2022)
	Transparency	Elhidaoui et al. (2022) and Rejeb et al. (2022)
	Information sharing	Rejeb et al. (2022)
	Interoperability	Rejeb et al. (2022)
Increased operational efficiencies	Rejeb et al. (2022)	
Improved decision making	Rejeb et al. (2022)	
Enhanced collaboration	Rejeb et al. (2022)	
Incentivization	Rejeb et al. (2022)	
Tokenization	Elhidaoui et al. (2022)	
Authentication	Fernando et al. (2021)	
Others	Job relevance	Abu Afifa et al. (2022) and Wan Muhamad et al. (2020)
	Accounting information quality	Abu Afifa et al. (2022)
	Personal enjoyment	Gao and Li (2021)
	Functional benefits	Liang et al. (2021)
	Symbolic benefits	Liang et al. (2021)
	Functional benefits	Nuryyev et al. (2020)

Table 9. Benefits, challenges and barriers of BC technology adoption.

Industries	Benefits	Challenges	Barriers
Agriculture	Existing BC-based platform such as HARA assist the agricultural industry to store, process activity data and transaction (Rijanto, 2021).	The integration of BC technology is strongly related to labor conditions, financing accessibility and social responsibility. Thus, adapting to this technology is required (Pradana et al., 2023).	Main adoption barriers among Agricultural stakeholders include lacking in government regulation and trust issue (Yadav et al., 2020).
Education	BC technology enables users in ideas and concept exchange, integration of a tracking system for learning result, regulation of payment and contracts, assessment of learning and recording progress of students' academic and facilitation of peer teaching (Eaganathan et al., 2019).	Acceptance of BC technology in education could be hampered by privacy challenges as some educational institutions may have low degree of openness of its learning resources (Ullah et al., 2021).	Doubt and readiness to accept the introduction of new technology like BC among users are a critical challenge to successful application of BC in education (Wan Muhamad et al., 2020).
Energy	BC technology supports the improvement in the energy sector, particularly on zero carbon production (Ullah et al., 2020).	As with other new platforms, BC-based platforms must also attract adequately large number of market participants so that there are positive network externalities (Burger & Weinmann, 2022).	Inter-platform competition (technological constraints and platform competition), value proposition and business strategy (focus was on products, platforms and transaction rather than procedural use cases offering standardization and low level of inclusiveness regarding processes) and regulatory complexity were identified as barriers in energy organizations (Burger & Weinmann, 2022).
Finance and banking	Positive impact on government policy, internet infrastructure and financial literacy, transaction cost and risk analysis to improve profitability and performance of bank (Aketch et al., 2021).	The use of bitcoin and cryptocurrency has been associated with money laundering and terrorism financing, thus, posing some strict regulations from the government (Onyekwere et al. 2023).	Management leadership buy-in, transaction cost efficiency and storage, energy efficiency, scalability, security and integrity, user data privacy, user engagement and desirability, ease of local and international legislation and regulation, personnel training, availability of fund for implementation, professional consultation and advisory capability, blockchain talent availability, integration with other e-commerce platforms and cloud services, incentive for miners, robustness of smart contract and deployment of business case, full ecosystem interoperability, technological maturity and standardization (Mishra et al., 2023).
Healthcare	In ophthalmology BC has transformed the network, enabling transparency as well as efficient large-volume data sharing across digital platforms while upholding integrity at all transactions (Gurnani et al., 2023).	BC addresses the problem of regulatory and government readiness, business entity readiness, solution providers readiness, end-user readiness (Sanda et al., 2022).	Key facilitating conditions must be attained to ensure successful BC technology adoption which include supportive regulatory and legal structures, innovation propensity, privacy and trust (Balasubramanian et al., 2020). Hira et al. (2022) is concerned that health information technology does not protect patient confidentiality. Lacking in data storage capability, data privacy and security, data standardization, BC infrastructure; existence of issues such as high data ownership, scalability, high cost of development and maintenance, exposing patient to high risk on data breach and theft, poor vision for project implementation, high level of management's support that is lukewarm, lacking in technical expert capable of handling high complexity of the technology, lack of infrastructure related to BC, lack of data privacy and security are adoption barriers identified in Sharma and Joshi (2020).

(Continued)

Table 9. Continued.

Industries	Benefits	Challenges	Barriers
Logistics	Transparency, traceability and security for logistic sector are significant benefits stated in Lim and Kamaruddin (2023).	As an emerging trend, social acceptance and workers' attitude towards BC technology is considered as a major challenge (Lim & Kamaruddin, 2023).	Lack of proper government regulation and absence of regulatory standards are major barriers of BC technology adoption (Yadav et al., 2020).
Maritime	Maritime companies that use disruptive technology like BC earlier than others could potentially become more competitive and provides these companies with advantages (Balci & Surucu-Balci, 2021)	Scalability, interoperability, uncertainty in government regulations and data management are ongoing challenges in BC application (Balci & Surucu-Balci, 2021).	Lacking in government regulation, trust, privacy, knowledge and understanding of BC, support from influencing stakeholders as well as concerns on business information sharing, resistance of some stakeholders to adopt are among barriers of adoption (Balci & Surucu-Balci, 2021).
Oil and gas	Close relationship with suppliers and customers, application of just in time management and strategic planning, enabling outsourcing to many suppliers, e-procurement, third party logistics, subcontracting impact positively in operational performance with BC are benefits for maritime organizations (Aslam et al., 2021).	Due to challenges in security and need for high degree of coordination, the transformation of companies into BC-based operations might take many years to become a reality (Aslam et al., 2021).	Oil industry has complex supply-chain networks and the integration of blockchain needs to consider these complexities (Aslam et al., 2021).
Supply chain	BC enabling automatic processes in a holistic way over several business partners, cost benefit with bullwhip effect reduction, enhanced transparency from smart contract, data verifiability, zero alteration of data and enabling product and service tracking, traceability and BC as a single source of information with multiple sources integrated as a single source (Jardim et al., 2021).	Choice of business partner influence the acceptance of solution as the whole supply must have readiness for adoption so that there are assistance and support to mitigate trust issues (Jardim et al., 2021).	Lack of management vision to accept BC technology in th industry, concerns on privacy, cultural difference among supply chain partners, regulatory uncertainty, technological immaturity, lack of awareness about benchmarking and benefits are adoption barriers (Bag et al., 2021). Barrier factors—technological (cost, immaturity, incompatibility, complexity, scalability, insecurity and privacy concerns); organizational (technological awareness, knowledge and expertise, perceived risk of vendor lock-in, perceived effort in collaboration); and environmental (perceived constraints of government support, proper regulations and infrastructure) are barriers for BC adoption (Choi et al., 2020).

countries like Malaysia, India, Vietnam, Pakistan and Indonesia. Further to that, the review on the 86 articles from five databases indicated that research on BC adoption has extended to other sectors especially in healthcare, education, logistics, SMEs and tourism. In fact, BC technology application aside from Bitcoin in the banking and finance industry is also on the increase.

Further to that, the review on existing articles available in various databases showed that BC technology adoption and application seem to be highly correlated with supply chain management. This is not surprising considering that every industry is operating through a multilinear network between different levels and stages of producers and consumers (Alsmadi et al., 2023; Corradini et al., 2023). The accomplishment of BC technology in managing the supply chain as shown from success stories of Walmart and IBM which had used BC-based solution in China to track their products using a farm-to-table approach while maintaining transparency and complete information at every stage of the supply chain, had garnered more interest to carry out BC technology adoption studies in supply chain management (Agi & Jha, 2022). Nonetheless, there appears to be a shifting tendency to focus on a particular industry in recent years rather than on supply chain in general. For instance, BC technology adoption studies have expanded to the oil and gas industry which is renowned for its sophisticated engineering solution in the exploration of oil and gas, yet lagging behind in terms of innovative digital technology adoption for improving operational excellence (Aslam et al., 2021). Healthcare which is a knowledge intensive industry with massive health and medical information as well as personal health records, showed exponential growth of research coverage in the last five years.

A significant shortcoming unearthed from the reviewed studies is the lack of measurements for actual BC use. In fact, a few of the selected articles were theoretical and conceptual without being tested with field survey. Further to that, most of the studies were cross-sectional or based on second data analysis. Despite the rich information provided from this review, the need for a longitudinal study is highlighted as this could give deeper insights into behaviors associated with adoption of BC technology.

4.3. Benefits, challenges and barriers of BC technology adoption and acceptance

The reviewed articles also included a systematic search for contents related to benefits, challenges and barriers of intention to use BC technology across the industries and specific to a particular industry. [Table 9](#) has summarized the current situation faced by stakeholders in different industries concerning BC technology adoption. In general, BC technology application in any industry provides numerous benefits to the stakeholders but at the same time, there are challenges and identified barriers to impede successful BC technology adoption and application in any industry.

The benefits of BC technology adoption are becoming more apparent as it has been realized that adopting BC technology is not just about technical upgrading but its unique features like decentralization, transparency and authentication are effective solution to issues of current systems and exploration of new opportunities (Fernando et al., 2021; Orji et al., 2020; Pradana et al., 2023; Rejeb et al., 2022; Toufaily et al., 2021). For instance, a common concern in the existing systems of supply chain management is the failure to track the amount and distribution of benefits to diverse supply chain actors in a consistent and accurate manner. As mentioned in [Jardim et al. \(2021\)](#), BC technology automates the processes in a holistic manner spanning over diverse business partners that this reduces the bulk of the cost in supply chain management. Another example is the healthcare industry, whereby BC technology can enhance among others, care quality, privacy and data security that are concerns in current healthcare processes. A news report by Market Research Future (MRFR) claimed that BC technology is forecasted to generate over 42 million dollars in value by 2023, in healthcare with a 71.8% compound annual growth rate (Prokofieva & Miah, 2019). In the education industry, the management and distribution of information has been revolutionized by BC technology adoption (Yu et al., 2023). As stated by [Hader et al. \(2020\)](#), trust is a common issue and barrier in most industries when it comes to data sharing that the use of BC technology somehow encourages stakeholders to consider adopting this technology as it provides numerous benefits like shareability, traceability, immutability, transparency and interoperability. Hence, studying BC adoption in developing and emerging countries have gained fresh insights that could be different in developed countries. In fact, [Kshetri \(2017\)](#) opined that due to the outmoded record-keeping systems, prevalent public distrust of authorities and their readiness to adopt new technologies like smartphones, they could become early adopters of BC technology in various economic and social sectors. Further to that, [Balci and Surucu-Balci \(2021\)](#) that early adopters could gain better competitiveness against rivals in the maritime industry. The outcomes from this review showed that despite the increasing number of available studies on BC adoption in countries besides developed nations, the number of these studies is still limited, particularly in the least developed countries that could benefit significantly from BC technology in providing solutions to issues of their current systems. Hence, further studies investigating the adoption of BC in developing and emerging countries should be further encouraged.

As highlighted in [Gurnani et al. \(2023\)](#), BC technology could potentially avoid incidence of cybercrime and malware that could tamper with patients' record without their knowledge. Additionally, [Kuberkar and Singhal \(2021\)](#) also acknowledged the contribution of BC technology to preserve data integrity and data privacy of donor and recipient in the blood bank. The transparency feature of BC technology enables a more reliable tracking and tracing of medical supplies.

Additionally, the report in [OECD \(2021\)](#) shows BC technology could be used to serve and enhance processes in more than 58 industries. In fact, [Kouhizadeh et al. \(2020\)](#) confirmed the capability of BC technology in minimizing asymmetries in information and costs of transaction. It may also facilitate the efforts of new and small enterprises to address persistent obstacles associated with the size, denseness and lack of company history, increasing trade and accessing funding ([Bag et al., 2021](#); [Marco & Lakhani, 2018](#); [Wong et al., 2019](#)). Findings from this study implied that despite the steady growth of BC technology adoption studies in general, the adoption of BC technology in some industries may not be as rigorous as it is hoped

to be. Thus, the determination of adoption factors, benefits, challenges and barriers to BC technology adoption as were highlighted in this study are crucial in facilitating active growth in the lagging industries.

4.4. Identified research gaps in BC technology adoption studies

This review had focused on BC technology adoption in various industries in developing and emerging countries. In determining the BC technology adoption factors, theories and models were used to provide the underlying theories in developing the conceptual framework in the reviewed articles. Despite the popularity of TAM and UTAUT as the main theories to understand adoption intention and behavior in various industries, studies showed that not all of the factors in TAM and UTAUT are significant predictors. However, PU and PEOU consistently showed significant result most of the time (Altamimi et al., 2022; Borhani et al., 2021; Kabir & Islam, 2021; Mat Razali et al., 2021; Soon, 2019; Wan Muhamad et al., 2020). In the case of UTAUT, effort expectancy, performance expectancy and social influence are more likely considered as predictors of intention (Abu Afifa et al., 2022; Hira et al., 2022; Latif & Zakaria, 2020; Wahab et al., 2020; Wamba & Queiroz, 2019) but facilitating conditions are often omitted from the studies (Abu Afifa et al., 2022; Hira et al., 2022; Nuryyev et al., 2020). Other than TAM and UTAUT, the TOE framework provided more factors that can be considered in the BC technology adoption intention model. Similarly, other theories such as TPB, TRI, Task Technology Fit, Norm Activation Model, Trust Model and BC characteristics itself also provide more selection of factors. Nevertheless, these studies also implied that there is no comprehensive model that could explain BC technology adoption in developing and emerging countries irrespective of industry type. Pradana et al. (2023) stated that the business ecosystem, the potential capabilities of BC technology and the characteristics or properties of BC should be considered as factors to explain adoption intention and behaviors. Thus, despite the wide range of theories and explored factors from past studies, identifying the right factors to explain adoption intention behaviors in a particular industry or country is still a challenge. This gap requires a more focus research approach in determining the critical factors that should be considered to understand adoption intention and behaviors.

In addition to that, this review has unearthed some of the benefits of BC adoption in various industries which identifies this disruptive technology as an added advantage to improve efficiency, performance and productivity of organizations. Nevertheless, there were also many challenges and barriers identified in every industry that could hamper the effective adoption and application of BC technology. Pradana et al. (2023) highlighted the importance of integrating knowledge of BC technology capabilities and properties with the digital business ecosystems of the industry and country. In this ecosystem, BC technology is no longer be offered singularly but integrated with other technologies such as IoT, Cloud computing, artificial intelligence, machine learning and others (Albshri et al., 2023; Du et al., 2023; Pu et al., 2023). Thus, adoption studies might need to explore and investigate more about the challenges and barriers of an integrated BC-based technology adoption and application, rather than on BC technology itself.

5. Conclusion and recommendations

This systematic review of current literature showed that BC technology adoption is still at the initial and infancy stage in most industries in developing and emerging economies. As can be seen from the review of articles within the last five years, the interest in BC technology is indeed escalating as this innovation has led to greater efficiency and effectiveness of achieving organizational goals across industries and countries. It has transcended from bitcoins in the banking and finance industry to numerous applications to support data sharing in various industries such as healthcare, logistics and tourism, improving traceability and transparency across the industries and bridging integration in a globalized market (Dehghani et al., 2022; Sanda et al., 2022; Ullah et al., 2021). Hence, the acquisition of more information through systematic literature review enables the essence of BC intervention in various industries throughout the world.

Further to that, the outcomes of this study have assisted in identifying the adoption factors that are focused on by recent studies and the underlying theories relevant to explain BC technology adoption

behavior among users in developing and emerging countries. Additionally, this study also highlighted the benefits, challenges and barriers of BC technology adoption across the industries. Thus, this study has offered a comprehensive view of BC technology adoption that expanded from theoretical framework to conceptual framework with a diverse collection of empirical evidences from past studies. As a result, this review provided valued information that could guide future research initiatives on BC technology adoption in developing and emerging countries.

Presumably, this technology is still in its early phases of development in most sectors and industries and requires more vigorous and continuous assessment, but it has the significant potentials to increase much needed innovation in the future regardless of the type of industry. Nevertheless, being a disruptive and emerging technology that has the flexibility to integrate with other technologies, continuous effort in adoption studies is needed to ensure that there is readiness to use these technologies. Meanwhile, the highlighted challenges and barriers must be taken into serious consideration so that the right and effective strategies can be employed to overcome these issues.

6. Practical implications

Since many industries could potentially gain multiple benefits from the application of BC technology within and across organizations, it is crucial to identify the right factors influencing adoption intention and behavior, and at the same time, understand the challenges and barriers of BC technology adoption by organizations in a particular industry. It is important that researchers focus on every detail of BC that is not limited to popular theories and models but also on BC characteristics and properties as well as the digital business ecosystem of the industry and country. As the complexity of disruptive technology becomes even greater through more integration with other technologies, it is imperative to gain greater understanding about the issues of BC technology adoption itself. Firstly, the review of recent articles has shown that these efforts have been realized but it has also highlighted the disparity in research concentration which are more active in some countries like Malaysia, India, China, Taiwan, Vietnam and Middle East countries but grossly lacking in other countries, particularly the least developed countries. Besides that, the review of BC technology adoption studies across industries in the past five years highlighted some important findings too.

Secondly, the diffusion of BC technology is comparatively different across the industries. Although there is a steady influx of BC technology adoption studies carried out in healthcare and education, other industries seem to be lagging behind. Thus, there is a need to explore other industries as well which could equally benefit from BC technology application in their operations. Since BC technology deals with distributed ledger across organizations and industries, understanding barriers and challenges of BC adoption in numerous industries in developing and emerging countries could lead to greater and faster diffusion of the technology to boost performance and productivity.

Thirdly, government regulations and policies as well as regulation uncertainties were cited as the major implementation setbacks of BC technology in most industries (Rijanto, 2021; Sanda et al., 2022). Yadav et al. (2020) highlighted other adoption barriers such as high investment cost, security and privacy concern, resistance to BC culture which could potentially delay BC technology adoption in organizations and industries. Despite that, these factors are less given emphasis in studies unlike other factors like trust and relative advantage and top management support. Thus, there is a need to develop research models which could provide a more comprehensive coverage of factors related to significant adoption barriers. Lastly, BC is not a stand-alone technology as it has been shown in the reviewed article that BC can be integrated with other rising technologies such as big data, Internet of Things, artificial intelligence and others (Cheng et al., 2019; Kim et al., 2019; Kuberkar & Singhal, 2021; Ullah et al., 2021). Thus, the adoption of an integrated BC technology with other technologies should be considered in future research to facilitate better understanding.

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