Continuance Intention in Blockchain-Enabled Supply Chain Applications: Modelling the Moderating Effect of Supply Chain Stakeholders Trust

Samuel Fosso Wamba(✉)

Toulouse Business School, Toulouse, France
s.fosso-wamba@tbs-education.fr

Abstract. If blockchain technologies are emerging as important game changers in the supply chain, this is largely attributed to their high operational and strategic business value. While this high potential is acknowledged by the practitioner's literature, very few empirical studies have been conducted on the factors explaining the adoption, use and continuance of blockchain-enabled supply chain applications. To fill this knowledge gap, this study extended the expectation-confirmation model (ECM) by integrating the supply chain stakeholders trust to analyze to the continuance intention in blockchain-enabled supply chain applications. The proposed model was tested and supported by the data collected among 344 supply chain professionals in India. The paper ends up with the formulation of important implications for practice and research.

Keywords: Blockchain · Continuance intention · Supply chain India · Supply chain trust

1 Introduction

Blockchain technologies are emerging as important game changer in the supply chain, especially because of their high potential benefits and capabilities. These technologies could transform almost all supply chain-related processes, including by reducing supply chain errors and by enabling supply chain automation [1] and end-to-end supply chain security.

While the benefits related to blockchain technologies-enabled supply chain applications have been discussed by media, very few empirical studies have conducted to assess their real business value. For example, a systematic review conducted by [2] on bitcoin, blockchain and FinTech in the supply chain found that the survey method approach was used for only 8% of the recorded cases. Consequently, this study aims to bridge the knowledge gap identified in the literature by developing an extended version of the ECM that integrates the supply chain stakeholders trust to analyze the continuance intention in blockchain-enabled supply chain applications.

We draw on the literature on blockchain, studies using the ECM as well as studies on supply chain stakeholders risk to address our research objective. After the

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introduction, the firsts section of this study describes the theoretical development. The next sections deal with our research methodology and the discussion of the results.

The paper ends with a conclusion, research implications, and the limitations and future research perspectives of the study.

2 Theoretical Development

The model developed in this study (Fig. 1) is an extension of the expectation-confirmation model [3, 4] with supply chain stakeholders trust. The expectation-confirmation model (ECM) was proposed by [3] to assess cognitive beliefs that influence the user's intention to continue using information systems (p. 351). The author argued that "users' continuance intention is determined by their satisfaction with IS use and perceived usefulness of continued IS use. User satisfaction, in turn, is influenced by their confirmation of expectation from prior IS use and perceived usefulness" (p. 351).

The ECM has been used by various scholars in different settings. For example, [5] extended the ECM by incorporating the theory of planned behavior to examine the mobile data service continuance. [6] used an extended version of the ECM to investigate the continuance use of mobile instant messaging in South Korea. [7] developed and tested several adoption and continuance models. [8] incorporated the perceived risk into the ECM to assess the continuance intentions of physicians using electronic medical records.

Drawing on this stream of research, we propose the subsequent hypotheses in the context of blockchain-enabled supply chain applications:

H1: Perceived usefulness has a significant positive effect on satisfaction.
H2: Confirmation has a significant positive effect on satisfaction.
H3: Confirmation has a significant positive effect on perceived usefulness.
H4: Satisfaction has a significant positive effect on the user's intention to keep using blockchain technologies-enabled supply chain applications.

Moreover, we argued that in the context of supply chain, trust among supply chain stakeholders will play an important role in the adoption, use and continued use of blockchain technologies-enabled supply chain applications. Indeed, prior studies found that trust plays an important role during the IS adoption and use process [9, 10].

[11] argued that inter-organization trust is an important decision factor during the adoption process of electronic procurement. We draw on these prior studies and propose that in the context of blockchain technologies-enabled supply chain applications, trust among all supply chain stakeholders will play a critical role not only during the adoption, use and continuance process, but also for satisfaction. Therefore, we propose the following hypotheses:

H5: Supply chain stakeholders trust has a significant positive effect on the user's intention to continue to use blockchain technologies-enabled supply chain applications.
H6: Supply chain stakeholders trust will moderate the relationship between satisfaction and the user's intention to continue to use blockchain technologies-enabled supply chain applications.

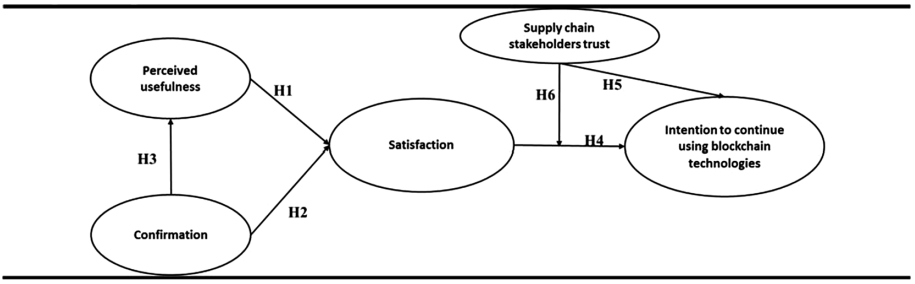

Fig. 1. Proposed research model

Table 1. Loadings, composite reliability (CR) and average variance extracted (AVE) values of our constructs

Constructs	Item	Loadings	CR	AVE
Confirmation (CONF)	CONFI1	0.866	0.906	0.763
	CONFI2	0.893		
	CONFI3	0.861		
Intention to continue to use blockchain technologies (CONT)	CONT1	0.871	0.881	0.711
	CONT2	0.872		
	CONT3	0.783		
Perceived usefulness (PU)	PU1	0.821	0.897	0.686
	PU2	0.820		
	PU3	0.851		
	PU4	0.819		
Satisfaction (SAT)	SAT1	0.833	0.916	0.731
	SAT2	0.869		
	SAT3	0.865		
	SAT4	0.852		
Supply chain stakeholders trust (SCTRU)	SCTRU1	0.864	0.903	0.700
	SCTRU2	0.807		
	SCTRU3	0.854		
	SCTRU4	0.821		

3 Methodology

The study uses a web-based survey to collect data from 344 (70.1% males and 29.9% females) supply chain professionals who have at least three years of experience with blockchain in India. The data collection process was handled by a market research firm called ResearchNow (https://www.researchnow.com/?lang=gb). Our items were adapted from prior studies [3, 12]. They were all measured using a seven (7)-point Likert scale. The data analysis was realized using **SmartPLS**, version 3.0 [13], which is a partial least squares (PLS) structural equation modeling (SEM) tool. It is a relevant

tool to evaluate the SEM measurement and structural model. In addition, it has various useful data analysis approaches embedded into the tool, including the two-stage approach proposed by [14] to assess the moderating effect.

4 Results and Discussion

Table 1 displays all information related to the reliability and validity of our constructs. We can see that all the values of the loadings, CR and AVE are respectively higher than 0.7, 0.7 and 0.5, all of which are the acceptable threshold values suggested in the literature [15, 16]. Therefore, we can include all constructs in the proposed research model.

The discriminant validity was tested by comparing the correlation matrix values with the square root of the AVEs in the diagonals. As we can see in Table 2, all the values of the square root of the AVEs in the diagonals are higher than the inter-correlation with other constructs, thus confirming the discriminant validity [17–19].

Table 3 describes the results of the structural model, including the moderation effect analysis. It clearly indicates that all the standardized path coefficients of all our proposed hypotheses are significant at the levels of 0.001 (for CONF → PU, CONF → SAT, SAT → CONT and SCTRU → CONT) and 0.05 (for PU → SAT and the moderating relationship). Consequently, all our proposed hypotheses (H1–H6) are supported (Table 4).

Table 2. Correlation and AVEs

	1	2	3	4	5
CONF	**0.874***				
CONT	0.795	**0.843***			
PU	0.605	0.591	**0.828***		
SAT	0.746	0.734	0.551	**0.855***	
SCTRU	0.609	0.574	0.717	0.625	**0.837***

*Square root of AVEs on the diagonal

Table 3. Results of the structural model, including the moderation effect analysis.

	Beta(sig.)	T Statistics (|O/STDEV|)
CONF → PU	0.605****	11.249
CONF → SAT	0.651****	8.957
PU → SAT	0.158**	2.131
SAT → CONT	0.646****	9.599
Moderator	0.081**	2.382
SCTRU → CONT	0.236****	3.862

****P < 0.001; ***P < 0.01; **P < 0.05; *P < 0.1

Table 4. Results of hypothesis tests.

Hypothesis	Results
H1: Perceived usefulness has a significant positive effect on satisfaction	Supported
H2: Confirmation has a significant positive effect on satisfaction	Supported
H3: Confirmation has a significant positive effect on perceived usefulness	Supported
H4: Satisfaction has a significant positive effect on the intention to keep using blockchain technologies-enabled supply chain applications	Supported
H5: Supply chain stakeholders trust has a significant positive effect on the intention to continue to use blockchain technologies-enabled supply chain applications	Supported
H6: Supply chain stakeholders trust will moderate the relationship between satisfaction and the intention to continue to use blockchain technologies-enabled supply chain applications	Supported

5 Conclusion and Future Research Directions

The main objective of this work was to apply an extended version of the ECM [3] that integrates the supply chain stakeholders trust to assess the continuance intention to use blockchain technologies-enabled supply chain applications. Data were collected from supply chain professionals in India and were analyzed using version 3.0 of SmartPLS in order to test the proposed research model. The study's results provided a strong empirical validation of all our proposed hypotheses when using the ECM in the context of blockchain technologies-enabled supply chain applications.

The study also highlighted the importance of trust among supply chain stakeholders in supporting a continued use of blockchain technologies-enabled supply chain applications. However, further research may be needed to solve further issues related to the use of survey; longitudinal case studies could well be used in this regard. In addition, it would be interesting to study unobserved heterogeneity in the use of SEM to study blockchain-enabled applications [20].

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