

Integrating TOE Framework and UTAUT to Explain Online Supply Chain Finance Platform Adoption: Evidence from C2FO Users

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ABSTRACT

Online supply chain finance platforms allow suppliers to convert approved receivables into cash before invoice maturity, but participation among Taiwanese small and medium-sized enterprises has not been examined at the adopting-firm level. This study integrates the technology-organization-environment framework with the unified theory of acceptance and use of technology, extended with trust, and specifies the three contexts as antecedents of user perceptions rather than as direct predictors of behavioral intention. The outcome construct is continued use intention because respondents were screened for work experience with the platform, and the decision under examination follows first use rather than preceding it. We analyzed survey data from 200 managers at Taiwanese enterprises using the C2FO platform, and the model supported ten of the twelve hypothesized relationships. The environmental context produced the largest coefficient on performance expectancy, effort expectancy, and trust, and the technological context influenced all three perceptions. The organizational context influenced trust but neither performance expectancy nor effort expectancy. Performance expectancy and trust had comparable effects on adoption intention, whereas effort expectancy had a smaller effect. All three contexts exerted significant indirect effects on intention through the perceptual constructs. The findings specify the perceptual route through which contextual conditions reach the continued use of an online supply chain finance platform at the organizational level, establish trust as a required extension in supply chain finance, and identify a boundary condition on the organizational context in small firms.

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1. INTRODUCTION

Financial technology (FinTech) has reshaped how supply chains are financed and has widened the range of financing options available to small and medium-sized enterprises (SMEs) operating under persistent working capital constraints [1]. Supply chain finance (SCF) refers to short-term arrangements that optimize working capital across accounts payable, accounts receivable, and inventory. The literature distinguishes finance-oriented arrangements led by financial institutions from supply-chain-oriented arrangements agreed between trading partners [2]. Online SCF platforms operate on a supply-chain-oriented principle by connecting a single buyer with multiple suppliers and settling approved invoices before their due dates in exchange for a negotiated discount. C2FO is one such platform, allowing suppliers to convert approved receivables into cash without drawing on bank credit lines. An online SCF platform is an inter-organizational information system: the buyer commissions it, the suppliers operate it, and invoice-level data and settlement instructions cross firm boundaries on it. Perceived benefits, organizational readiness, and pressure from trading partners have been used to explain a small firm's adoption of an inter-organizational system [3]. Taiwanese SMEs supply globally integrated manufacturing networks, and Taiwan has developed a domestic FinTech sector supported by venture capital investment [4]. Research on FinTech in Taiwan has concentrated on higher levels of aggregation, including bank-level investment decisions [5] and comparative FinTech development across Taiwanese municipalities [6]. Firm-level evidence on the determinants of continued participation in online SCF platforms among Taiwanese SMEs remains limited, leaving the conditions sustaining supplier participation untested in a market where such platforms are already in commercial use.

The Technology-Organization-Environment (TOE) framework specifies that an organization's adoption of a technological innovation is shaped by three contexts: technological, organizational, and environmental [7]. The technological context (TEC) comprises the innovation's attributes, including its relative advantage over existing practice, its compatibility with installed systems and working routines, and its complexity for the intended user [8, 9]. In an online SCF platform, TEC also comprises transaction security, data analytics, and interoperability with enterprise resource planning and accounting systems [8]. The organizational context (ORGC) concerns internal conditions that enable or constrain adoption. Top management support supplies strategic priority and budgetary commitment, and organizational readiness reflects IT infrastructure, personnel capable of operating digital finance systems, and financial capacity [10, 11]. ORGC also includes the

firm's capacity to move from established payment routines to discount-based settlement [10]. The environmental context (ENVC) concerns conditions outside the firm. Competitive pressure arises where rival firms use SCF platforms to improve their working capital positions, and customer pressure arises where large corporate buyers require suppliers to join a financing program [12]. Government regulatory support and the availability of digital infrastructure constitute additional environmental conditions [13]. Trading partner readiness operates through network effects, since platform value rises with the number of connected counterparties [14].

UTAUT identifies performance expectancy (PEXP), the belief that using a system improves task performance, and effort expectancy (EFEXP), the ease of system use, as determinants of behavioral intention, alongside social influence and facilitating conditions [15]. FinTech research extends the model with trust (TRU), the user's confidence in a platform's and its provider's security, reliability, and integrity, because financial platforms require disclosure of sensitive data under conditions of risk [16]. The present study retains PEXP and EFEXP, adds TRU, and does not model social influence or facilitating conditions, because the adoption decision under examination is organizational, and ORGC and ENVC capture the conditions those constructs represent. Research integrating TOE with UTAUT positions the three TOE contexts as antecedents of user perceptions rather than as direct predictors of intention [17]. Relative advantage and compatibility shape PEXP, since expectations of accelerated cash flow, lower financing cost, and improved payment terms follow from what the platform is judged capable of producing [18]. Complexity and integration requirements shape EFEXP, since compatibility with installed accounting and enterprise resource planning systems reduces the effort users anticipate [19]. Security architecture, authentication controls, and system reliability shape TRU, since suppliers must expose financial records and authorize payment modifications through the platform [20].

ORGC shapes these perceptions through the resources a firm commits to implementation [21]. Organizational readiness raises PEXP, because IT infrastructure, trained personnel, and financial capacity make successful implementation credible to the managers who evaluate the platform [10]. Training provision, technical support, and change management capacity raise EFEXP by removing implementation obstacles that would otherwise fall on the adopting unit [22]. Management commitment and the quality of inter-organizational relationships raise TRU, because both signal that the firm can operate a financing platform without exposing counterparties to loss [16].

ENVC conditions the same perceptions through pressures and supports outside the firm's control [18]. Competitive pressure and buyer requirements raise PEXP, because a supplier that declines to join a buyer's financing program risks its standing in that buyer's supply base [23]. Digital infrastructure availability, common industry standards, and trading partner readiness raise EFEXP by reducing the technical barriers an individual firm would otherwise need to clear without external support [24]. Regulatory frameworks

governing electronic payment modifications and the protection of financial data raise TRU by providing structural assurances beyond any individual platform provider.

Intention to use online SCF platforms (ISCF) is the model's outcome construct, and the experience condition imposed on the sample places the construct at the post-adoption stage. Karahanna, Straub et al. [25] separated pre-adoption beliefs, held by potential adopters evaluating an innovation they have not used, from post-adoption beliefs, held by users evaluating an innovation they already operate, and found that the two groups differ in the determinants of behavioral intention. Continuance is theorized as a decision distinct from initial acceptance, taken once a user has compared realized system performance against the expectations held before first use [26]. Organizational diffusion research locates the same separation at the firm level by treating initiation, adoption, and routinization as sequential stages, each governed by technological, organizational, and environmental contexts [27]. ISCF is therefore defined as a supplier firm's intention to continue using an online SCF platform to finance approved invoices.

PEXP predicts ISCF where users expect gains in payment speed, financing cost, and working capital efficiency from participation [28]. EFEXP predicts ISCF where the platform requires limited technical expertise and a short learning period, a condition that carries particular weight for SMEs operating small IT functions [29]. TRU predicts ISCF because participation requires disclosing invoice and banking data to a third party whose conduct the supplier cannot observe directly [30]. PEXP, EFEXP, and TRU therefore carry the effects of TEC, ORGC, and ENVC into ISCF, and the present study estimates the indirect effects transmitted along those pathways.

This research intends to cover the following gaps.

- 1) Examine the impacts of TEC, ORGC, and ENVC on the usage of UTAUT's PEXP, EFEXP, and TRU.
- 2) Employ UTAUT's PEXP, EFEXP, and TRU to explain the ISCF.

Examine the indirect impacts of TEC, ORGC, and ENVC on ISCF via UTAUT's PEXP, EFEXP, and TRU.

The study contributes to information systems research by integrating TOE with an acceptance model on three specifications. ENVC is estimated as an antecedent of PEXP, EFEXP, and TRU rather than as a direct predictor of ISCF, which differs from the integration of TAM with TOE in which environmental variables were specified as direct predictors of adoption [31]. TRU enters as a third perceptual construct, since participation requires disclosing invoice and banking records to a party whose handling of those records the supplier cannot observe [16]. The adopting unit is a supplier firm evaluating a platform commissioned by its own buyer, so competitive pressure, customer pressure, and the financed invoice originate with a single counterparty, and trust in supply chain finance is located between firms rather than between a consumer and a provider [32].

1.1. Prior Integrations of TOE with Acceptance Models

Integrations of an acceptance model with the TOE framework share one specification: the contexts enter as antecedents of the perceptual constructs, and the perceptual constructs carry their influence to the outcome. Gangwar, Date et al. [31] integrated TAM with TOE across 280 firms in the information technology, manufacturing, and finance sectors in India, placing technological and organizational variables as external variables of perceived usefulness and perceived ease of use, while specifying environmental variables as direct predictors of adoption. Sulaiman, Mahomed et al. [33] applied the same two-mediator specification to learning management system usage among university lecturers and included government policy among the external variables, so an environmental condition was routed through the perceptual constructs rather than modeled directly. Awa, Ojiabo et al. [34] combined TAM, the theory of planned behavior, and TOE into a framework for e-commerce adoption by SMEs, including perceived trust among its constructs, and derived eighteen propositions for empirical testing. Bouteraa [17] integrated TOE with UTAUT among bank consumers in the United Arab Emirates, situating the integration at the individual customer level.

The present study estimates all three contexts as antecedents of PEXP, EFEXP, and TRU and specifies no direct path to ISCF, so each context's total effect equals the sum of its indirect pathways, and the perceptual route is estimated rather than assumed [35]. The trust channel proposed by Awa, Ojiabo et al. [34] within an integrated framework for SMEs included propositions rather than estimates, and research on small businesses and FinTech identifies the organizational adoption setting as less developed than consumer adoption [36]. The present sample consists of supplier firms transacting on a platform commissioned by their buyer, a configuration in which trust operates between firms rather than between a consumer and a provider [32].

1.2. Technological Context, Performance Expectancy, Effort Expectancy, and Trust

The TOE framework treats an innovation's attributes as the object of organizational evaluation, so an adopting firm forms its expectations from the technology's observable properties [7]. Relative advantage serves as the reference point for that evaluation, since a supplier compares discounted early settlement with the cost and availability of its existing financing arrangements [9]. Compatibility and complexity operate on a separate channel. Both determine the work required before any benefit is realized, because invoice data must pass between the platform and the accounting or enterprise resource planning systems already installed [19]. Security architecture operates on a third channel. Authentication controls, encryption of transmitted records, and demonstrated system reliability constitute the observable evidence on which a supplier bases its judgment of whether exposing invoice-level financial data is safe [20]. Suppliers make this judgment before use, since they

cannot inspect a provider's internal controls and must infer them from the platform's visible design [37].

Evidence on technological antecedents comes predominantly from consumer settings. Bouteraa [17] integrated TOE with UTAUT among bank consumers in the United Arab Emirates and reported that system quality, self-efficacy, electronic word-of-mouth, and bank image influenced FinTech use alongside performance expectancy and facilitating conditions. Chan, Troshani et al. [38] examined consumer adoption of Open Banking, and Alkhwalidi, Alharasis et al. [19] examined FinTech users' adoption intention and electronic loyalty in a developing economy. In each sample, respondents chose personal transactions and had no obligation to integrate the service with an existing information system. Sharma, Ilavarasan et al. [36] systematically reviewed the small business and FinTech literature and found the organizational adoption setting underdeveloped relative to consumer adoption.

The adopting unit in the present study is a firm rather than an individual, which changes the technological attributes at play. An SME evaluating an online SCF platform must reconcile the platform with installed accounting systems and must expose invoice-level records to a trading counterparty, so relative advantage, compatibility, and security carry organizational consequences that a personal transaction does not create [9]. The present study therefore estimates TEC as an antecedent of PEXP, EFEXP, and TRU rather than as a direct predictor of ISCF.

H1a: TEC positively influences PEXP.

H1b: TEC positively influences EFEXP.

H1c: TEC positively influences TRU.

1.3. Organizational Context, Performance Expectancy, Effort Expectancy, and Trust

Organizational conditions shape adoption perceptions through the resources a firm can commit and the authority to commit them, which the TOE framework assigns to the organizational context [9]. Top management support converts an implementation from a discretionary project into a funded priority, and the resulting budget and staffing decisions determine whether managers regard the expected working capital gains as attainable [10, 11]. Organizational readiness operates on the burden the adoption places on the personnel who will run it. Where IT capability, trained staff, and change management capacity are already in place, the incremental work of learning to use and operate the platform falls to an equipped unit [22]. Management credibility operates on a third channel, since a supplier's willingness to route financial transactions through an external platform depends on whether its own leadership is judged capable of governing that exposure [16].

Findings on organizational antecedents diverge more than findings on technological ones. Marei, Mustafa et al. [10] examined TOE factors, FinTech adoption, and financial performance in Jordanian commercial banks and modeled organizational readiness as a moderator rather than a direct antecedent. Nagy, Arie et al. [39] tested organizational factors

as direct determinants among Hungarian and Indonesian SMEs and found no significant effect, contrary to prior literature that emphasized top management support and organizational readiness. Devi and Shunmugasundaram [21] examined adoption intention and perceived satisfaction among startup entrepreneurs, a population with a shallower managerial hierarchy than that of an established firm. The three studies differ in where the organizational construct sits in the model, a design difference rather than a disagreement about the underlying condition.

The present study estimates ORGC as a direct antecedent of the three perceptual constructs among Taiwanese SMEs, the setting in which organizational factors have not consistently predicted FinTech adoption [39]. The estimates therefore address whether organizational conditions affect adoption through user perceptions or not.

H2a: ORGC positively influences PEXP.

H2b: ORGC positively influences EFEXP.

H2c: ORGC positively influences TRU.

1.4. Environmental Context, Performance Expectancy, Effort Expectancy, and Trust

External conditions shape adoption perceptions through pressures and assurances originating outside the firm and beyond its control, which the TOE framework assigns to the ENVC [11]. Competitive and customer pressure affect expected benefits by changing the non-adoption costs: when a large buyer operates an early payment program, a supplier outside it settles on standard terms, while competitors inside it settle earlier [12]. Digital infrastructure and common industry standards affect anticipated effort because the wider market supplies the connectivity and data formats an individual firm would otherwise build [40]. Regulatory frameworks operate through a third channel by providing assurance no provider can offer on its own. Legal protection for financial data and enforceable rules governing electronic payment modification remain in force independently of the provider's own conduct [41].

Researchers have examined environmental antecedents largely through government support and competitive pressure, with results that depend on the institutional setting. Bani Atta [42] examined the adoption of FinTech products in Jordanian commercial banks under environmental regulations. Lin and Lee [24] examined continuous use of green FinTech under UTAUT with consumer social responsibility and long-term orientation as moderators, and Lee, Li et al. [43] examined green trust in continued green FinTech use through an expectation-confirmation model. Alrsheedi and P Iskandar [13] proposed a conceptual framework for FinTech adoption among Saudi banks and reported no empirical estimates; thus, the framework identifies candidate environmental factors without testing them. Across these studies, the environmental conditions examined were those facing banks or individual consumers, not those facing a supplier whose largest customer operates the financing platform.

The present study examines ENVC in Taiwan, where SMEs supplying globally integrated manufacturing networks operate under buyer requirements and within a domestic FinTech sector supported by venture capital [4]. The buyer that operates an online SCF platform is also the counterparty on the invoices being financed, which concentrates competitive and customer pressure in a single relationship.

H3a: ENVC positively influences PEXP.

H3b: ENVC positively influences EFEXP.

H3c: ENVC positively influences TRU.

1.5. Performance Expectancy and Intention to Use Online Supply Chain Platforms

UTAUT positions performance expectancy as the belief that a technology will improve the user's own task outcomes, with behavioral intention following from the anticipated size of the improvement [15]. For a supplier evaluating an online SCF platform, the anticipated improvement is expressed in cash: the discount conceded on early settlement is weighed against the financing cost avoided over the days remaining to the invoice due date [2].

FinTech adoption research supports performance expectancy, but its standing relative to competing antecedents remains unsettled. Bommer, Milevoj et al. [44] meta-analyzed 42 samples and found that hedonic motivation, price value, performance expectations, and social influence had the strongest relationships with intention to use FinTech, and further found that a three-antecedent model predicted almost as well as the full seven-antecedent model. Amnas, Selvam et al. [45] integrated UTAUT2 with a trust-theoretic model and found performance expectancy significant alongside effort expectancy, social influence, habit, price value, and facilitating conditions. Two of the antecedents ranked highest in the meta-analysis, hedonic motivation and price value, describe consumer motivations that do not arise when a finance manager evaluates a discount rate on the firm's behalf. Srivastava, Mohta et al. [28] sampled Gen Y and Gen Z digital payment users in India, and Bajunaied, Hussin et al. [46] extended UTAUT to FinTech services among individual users, so neither established the relationship for an organizational respondent.

The present study estimates PEXP among respondents with working experience of the platform, so the expected gain is assessed against settlement outcomes already observed rather than projected from the platform's published terms. Perceived usefulness, the belief from which PEXP is derived in UTAUT [15], continues to determine attitude after adoption, while several attributes that operate before adoption do not [25].

H4: PEXP positively influences ISCF.

1.6. Effort Expectancy and Intention to Use Online Supply Chain Platforms

Effort expectancy affects behavioral intention as a cost rather than a benefit. The anticipated learning and operating burden is subtracted from the expected gain, and

intention falls as that burden rises [15]. The subtraction weighs more heavily when resources to absorb the burden are scarce. An SME running a small finance function must assign platform onboarding, user administration, and reconciliation to staff already responsible for other duties [36].

Support for effort expectancy is weaker than for performance expectancy. Bommer, Milevoj et al. [44] did not place effort expectancy among the antecedents most strongly related to FinTech use intention, and their parsimonious model retained fewer antecedents than the full set. Amnas, Selvam et al. [45] found that effort expectancy was significantly associated with intention in a consumer FinTech sample. Sultana, Chowdhury et al. [47] surveyed undergraduates using an extended UTAUT model, and Phuong, Thuy et al. (2022) surveyed Generation Z users of FinTech payment services in Vietnam; both samples consist of individuals who can abandon an application without organizational consequences. Idrees and Ullah [29] compared Islamic and conventional banking users using UTAUT2, with education level as a moderator, and found that divergence in respondent characteristics, rather than platform design, mattered.

The present study surveys managers who commit a firm to a system they must operate, so effort is sustained over continued use rather than at the point of a single transaction. Ease of use contributes less to post-adoption attitude than to pre-adoption attitude, because experience replaces an expectation of operating difficulty with knowledge of the demand the platform imposes [25]. The effect of EFEXP on ISCF is therefore expected to be positive and smaller than the effect of PEXP.

H5: EFEXP positively influences ISCF.

1.7. Trust and Intention to Use Online Supply Chain Platforms

Trust operates through intention and vulnerability rather than benefit or cost. Adoption requires a supplier to disclose invoice, banking, and payment-term records to a party whose handling of those records it cannot observe, and intention depends on confidence that the exposure will not be exploited [16]. Exposure in supply chain finance extends beyond the platform itself. Invoice-level data reveals the terms a supplier has agreed with a buyer, so the same disclosure that enables financing also carries consequences inside the trading relationship [48].

Trust has been shown to determine FinTech intention across several national settings, though almost entirely among individual users. Zhang, Siyal et al. [49] surveyed commercial bank users in Pakistan on data security, customer trust, and adoption intention, and Zhao, Khaliq et al. [30] examined the determinants of trust in FinTech adoption in the same national setting. Roh, Yang et al. [50] investigated consumer trust and FinTech adoption in China, while Amnas, Selvam et al. [45] found that trust influenced both intention and actual use in a consumer sample. Jiang, Kang et al. [32] modeled trust transitivity among small and medium-sized manufacturing enterprises in a blockchain-

based supply chain finance context, the closest organizational parallel, and located trust between firms rather than between a consumer and a provider.

The present study estimates TRU when the trusting party is a supplier firm, the trusted party operates a platform commissioned by that supplier's buyer, and the object of trust is the handling of records bearing on an ongoing commercial relationship.

H6: TRU positively influences ISCF.

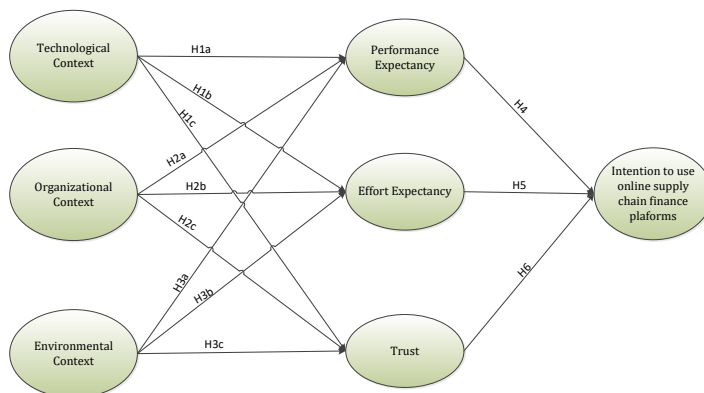


Figure 1. Theoretical Framework

2. RESEARCH METHOD

2.1. Research Design and Sampling Strategy

This study used a quantitative cross-sectional survey design to examine the determinants of online SCF platform adoption among Taiwanese SMEs, with a structured questionnaire as the data collection instrument. Purposive sampling was used because eligible respondents had to combine organizational authority over financing decisions with direct experience of the C2FO platform, and no sampling frame identifies that population [51]. Because this is a non-probability technique, the sample supports inference about the relationships specified in the structural model rather than estimating population parameters for Taiwanese SMEs as a whole.

The target population comprised SME managers, financial officers, supply chain managers, and procurement professionals in Taiwanese enterprises with working experience of the C2FO platform. Three screening criteria governed participation. The organizational criterion required firms to meet Taiwan's official SME definition and conduct accounts payable or accounts receivable management or working capital optimization activities. The positional criterion required the respondent to hold a mid-level or senior management role with oversight of financial operations, supply chain financing, or digital transformation initiatives. The experiential criterion required prior use of the platform, including familiarity with its functions, dynamic discounting mechanism, and early payment programs. The three criteria define a post-adoption population. The estimates

therefore describe the formation of continued use intention among firms already transacting on the platform, and not the initial adoption decision of firms outside it. Organizational diffusion research separates initiation, adoption, and routinization and reports that a single contextual condition can operate in opposite directions across those stages [27], so the sampling restriction bounds the population to which the coefficients apply.

2.2. Sample Size Determination and Statistical Power

The minimum sample size was estimated with the inverse square root method, which derives the requirement from the smallest path coefficient the study was designed to detect and does not depend on the number of indicators [52]. Kock and Hadaya [52] report that the ten-times rule, which sets the requirement at 10 times the largest number of inner or outer model links directed to any latent variable, produces imprecise estimates. At a significance level of 0.05 and statistical power of 0.80, detection of a minimum path coefficient of 0.20 requires 155 observations under the inverse square root method. The structural model specifies three paths to each of PEXP, EFEXP, and TRU, and three to ISCF, for a total of 12 hypothesized relationships. Data collection yielded 200 valid responses, exceeding the estimated minimum for the measurement and structural assessments reported in Tables 1 to 5.

2.3. Data Collection Platform and Procedure

Data were collected through SurveyMonkey, an online survey platform supporting unique-link distribution, response validation, and progress tracking [53].

Data collection proceeded in four stages: participant identification, invitation and consent, questionnaire completion, and reminder follow-up.

Participants were identified through four channels. The C2FO Taiwan-registered user database provided access to qualified SMEs on the platform. Business directories maintained by the Taiwan External Trade Development Council provided contact details for export-oriented SMEs in international supply chains. The Taiwan Electrical and Electronic Manufacturers' Association and the Taiwan Textile Federation provided access to member firms that use supply chain finance arrangements. Professional networking platforms were used to reach finance and supply chain personnel in Taiwanese SMEs. Initial contact was made via a personalized email outlining the research purpose, confidentiality protections, and the questionnaire link. Respondents who opened the link were shown an informed consent page outlining their rights, data protection measures, and the right to withdraw, followed by the screening questions. Only qualified respondents proceeded to the main questionnaire.

Qualified respondents completed the bilingual questionnaire, which covered demographic information, organizational characteristics, and the Likert items measuring

TEC, ORGC, ENVC, PEXP, EFEXP, TRU, and ISCF. Progress indicators were displayed throughout, and attention check items were embedded to identify inattentive responding.

A follow-up protocol was used to raise the response rate. A first reminder was sent one week after the invitation, a second two weeks after the invitation, and a final reminder three days before the survey closed.

Responses were screened after the survey closed. Incomplete submissions were discarded, as were responses completed in under five minutes, since a completion time below that threshold indicates insufficient attention to the items. Duplicate submissions were identified through IP address analysis, and responses showing straight-line patterns across items were removed as careless responding. Screening produced 200 usable responses from 288, a response rate of 69.44%.

2.4. Questionnaire Development and Validation

The research instrument comprised a structured questionnaire developed through scale adaptation and validation procedures addressing content validity, construct validity, and cultural appropriateness in the Taiwanese SME context. All measurement scales were adapted from previously validated instruments with established psychometric properties in FinTech, supply chain finance, and technology adoption research.

The instrument was assembled from previously validated scales and adapted to the online SCF setting. TEC and ORGC were measured with items from Lutfi, Al-Khasawneh et al. [54]. ENVC was measured with items from the same source together with items from Stjepić, Pejić Bach et al. [55], modified to cover trading partner readiness and industry standards. PEXP was measured with items adapted from Kabir and Islam [56], Weerakkody, El-Haddadeh et al. [57], and Maruping, Bala et al. [58], modified to capture working capital optimization, cash flow acceleration, and financing cost reduction. EFEXP was measured with items from Kabir and Islam [56], adapted to the platform's learning and operating demands. TRU was measured with items from Mou, Shin et al. [59], modified to address platform security, data protection, provider integrity, and transaction reliability. ISCF was measured with items adapted from Xu, Wang et al. [60], with item stems worded for continued use so the construct reflects a current participant's intention rather than that of a prospective adopter. The instrument comprised 34 items: eight for TEC, five for ORGC, six for ENVC, three for PEXP, four for EFEXP, five for TRU, and three for ISCF.

All items were measured on a 7-point Likert scale anchored at 1 (Strongly Disagree) and 7 (Strongly Agree). A bilingual researcher with expertise in business administration and supply chain finance translated the English instrument into Traditional Chinese, and a second bilingual expert who had not seen the original back-translated it into English, following established cross-cultural procedures [61]. The research team and bilingual experts resolved discrepancies between the original and the back-translated version through discussion, adjusting wording to preserve construct meaning. The team pilot-tested

the bilingual instrument with 30 Taiwanese SME managers to assess comprehension, identify ambiguous items, and record completion time; pilot responses were excluded from the main analysis.

3. RESULTS AND DISCUSSION

The model was estimated using partial least squares structural equation modeling, which was selected because the analysis is predictive in orientation, the model connects seven latent constructs through twelve structural paths, and the method imposes no distributional assumptions on the indicator data [62]. Estimation was carried out in SmartPLS 4 using the path weighting scheme. The structural model specifies TEC, ORGC, and ENVC as antecedents of PEXP, EFEXP, and TRU, and specifies no direct paths from the three TOE constructs to ISCF.

The measurement model was examined before the structural model, because structural estimates depend on the reliability and discriminant validity of the underlying constructs [63]. Internal consistency was assessed using Cronbach's alpha, composite reliability (ρ_a), and composite reliability (ρ_c), and convergent validity was assessed using average variance extracted, with the results reported in Table 1. Discriminant validity was assessed through the Fornell-Larcker criterion in Table 2 and the heterotrait-monotrait ratio of correlations in Table 3.

Once the measurement model satisfied the reporting criteria, the structural model was estimated. Path coefficients were computed from the full sample of 200 responses, and their significance was assessed through bootstrapping with 10,000 subsamples. Table 4 reports the path coefficients, *t* values, and *p* values for each of the 12 hypothesized relationships. Table 5 reports the total effects of TEC, ORGC, and ENVC on ISCF, which are equal to the indirect effects transmitted through PEXP, EFEXP, and TRU in a model without direct paths from the TOE constructs to the outcome.

3.1. Convergent and Discriminant Validity

Construct reliability and validity establish whether the indicators assigned to each construct measure it consistently and whether they share enough variance with it to represent it. Cronbach's alpha measures internal consistency by comparing the covariance among a construct's items with their total variance, and a value of 0.70 or higher indicates acceptable consistency [64]. Alpha assumes that all items contribute equally to the construct, which underestimates reliability when items differ in strength. Composite reliability ρ_a relaxes that assumption by weighting each item by its estimated loading and uses the same 0.70 floor [65]. Composite reliability ρ_c applies a comparable weighting under a less conservative estimator, and values are expected to fall between 0.70 and 0.95, where the upper bound signals that the items may be restating one another rather than sampling the

content of the construct [62]. The average variance extracted is the mean of the squared loadings of a construct's items, so it reports the share of item variance that the construct explains. Convergent validity is considered to hold when the average variance extracted is at or above 0.50 [66].

Outer loadings establish the share of an indicator's variance that its assigned construct explains, and a loading at or above 0.708 indicates that the construct explains at least half of that variance [54]. All indicators load on their assigned constructs above that threshold, with values ranging from 0.715 on ORGC4 to 0.961 on TRU3.

Every construct in Table 1 clears all four thresholds. Cronbach's alpha ranges from 0.831 for ORGC to 0.966 for TRU, rho_a from 0.848 to 0.966, and rho_c from 0.878 to 0.973. For each of the seven constructs, the three reliability coefficients are ordered as alpha, rho_a, and rho_c, which is the ordering the estimators predict, since alpha serves as a lower bound on reliability and rho_c as an upper bound, with rho_a positioned between them [65]. The average variance extracted ranges from 0.590 for ORGC to 0.880 for TRU, indicating that each construct explains more than half the variance in its indicators.

The two lowest values belong to ORGC at 0.590 and TEC at 0.629, and the breadth of the two definitions explains the ordering. Reflective measurement assumes that a construct's indicators are interchangeable representations of one concept [54]. ORGC is defined across top management support, organizational readiness, and the capacity to move from established payment routines to discount-based settlement, and TEC across relative advantage, compatibility, complexity, transaction security, and interoperability, so the indicators of each cover a set of related attributes rather than repeated expressions of one attribute.

Table 1. Construct reliability and validity

Constructs	Indicators	Factor Loadings	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
ENVC	ENVC1	0.759	0.910	0.913	0.930	0.690
	ENVC2	0.880				
	ENVC3	0.843				
	ENVC4	0.806				
	ENVC5	0.833				
	ENVC6	0.858				
EEXP	EEXP1	0.896	0.887	0.888	0.922	0.748
	EEXP2	0.856				
	EEXP3	0.871				

	EEXP4	0.835				
ISCF	ISCF1	0.936	0.857	0.876	0.914	0.781
	ISCF2	0.917				
	ISCF3	0.789				
ORGC	ORGC1	0.802	0.831	0.848	0.878	0.590
	ORGC2	0.762				
	ORGC3	0.837				
	ORGC4	0.715				
	ORGC5	0.719				
PEXP	PEXP1	0.920	0.838	0.849	0.902	0.754
	PEXP2	0.843				
	PEXP3	0.840				
TEC	TEC1	0.789	0.916	0.921	0.931	0.629
	TEC2	0.813				
	TEC3	0.804				
	TEC4	0.760				
	TEC5	0.820				
	TEC6	0.819				
	TEC7	0.761				
	TEC8	0.777				
TRU	TRU1	0.944	0.966	0.966	0.973	0.880
	TRU2	0.936				
	TRU3	0.961				
	TRU4	0.918				
	TRU5	0.931				

Note: EEXP = Effort Expectancy, ENVC = Environmental context, ORGC = Organizational context, PEXP = Performance expectancy, ISCF = Intention to use supply chain finance platforms, TEC = Technological context, TRU = Trust

Discriminant validity refers to the degree to which a construct is empirically distinct from the other constructs in the model [62]. The Fornell-Larcker criterion assesses it by comparing the square root of a construct's average variance extracted (reported on the diagonal of Table 2) with that construct's correlations with the remaining constructs in the same row and column. The criterion holds when the diagonal element exceeds all correlations associated with the construct [66]. Table 2 satisfies the criterion for all seven constructs. The narrowest margin belongs to ORGC, whose diagonal value of 0.768 exceeds its highest correlation, 0.689 with TEC, by 0.079. The highest inter-construct correlation in the matrix, 0.775 between TRU and EFEXP, remains below both associated diagonal values.

The heterotrait-monotrait ratio contrasts the average correlation of indicators across two constructs with the average correlation within each construct and detects deficient discriminant validity that the Fornell-Larcker criterion leaves undetected under common research conditions [67]. Ratios below 0.85 indicate discriminant validity between conceptually distinct constructs. Every ratio in Table 3 falls below that ceiling, with the highest at 0.835 between TRU and EFEXP and the second highest at 0.821 between PEXP and ISCF. Both ratios exceed their corresponding Fornell-Larcker correlations of 0.775 and 0.704 because the ratios are disattenuated and therefore estimate the association that would hold if both constructs were measured without error. The size of that upward adjustment depends on construct reliability. PEXP and ISCF have the two lowest Cronbach's alphas among the four constructs in these pairs, resulting in a wider gap between the raw correlation and the ratio.

The two pairs returning the highest ratios are also connected within the structural model, since PEXP predicts ISCF, and TRU and EFEXP draw on the same three antecedents. The framework anticipates shared variance between them rather than evidence of a single underlying construct. Both criteria therefore support discriminant validity across the seven constructs.

Table 2. Fornell-Larcker criterion

Constructs	ENVC	EEXP	ISCF	ORGC	PEXP	TEC	TRU
ENVC	0.831						
EEXP	0.572	0.865					
ISCF	0.615	0.694	0.883				
ORGC	0.507	0.503	0.414	0.768			
PEXP	0.591	0.688	0.704	0.520	0.868		
TEC	0.593	0.560	0.563	0.689	0.592	0.793	
TRU	0.653	0.775	0.724	0.580	0.718	0.630	0.938

Note: EEXP = Effort Expectancy, ENVC = Environmental context, ORGC = Organizational context, PEXP = Performance expectancy, ISCF = Intention to use supply chain finance platforms, TEC = Technological context, TRU = Trust

Table 3. Heterotrait-monotrait ratio (HTMT)

Constructs	ENVC	EEXP	ISCF	ORGC	PEXP	TEC	TRU
ENVC							
EEXP	0.629						
ISCF	0.689	0.791					
ORGC	0.535	0.557	0.468				
PEXP	0.666	0.776	0.821	0.586			
TEC	0.638	0.608	0.616	0.771	0.651		
TRU	0.689	0.835	0.788	0.616	0.782	0.656	

Note: EEXP = Effort Expectancy, ENVC = Environmental context, ORGC = Organizational context, PEXP = Performance expectancy, ISCF = Intention to use supply chain finance platforms, TEC = Technological context, TRU = Trust

3.2. Empirical Results of the Study

Under a two-tailed test at the 5 percent level, a hypothesis is supported when the t value reaches 1.96, and the p value falls below 0.05. Table 4 reports the twelve hypothesized paths against those thresholds, of which ten are supported.

TEC influences all three perceptual constructs. The coefficients are 0.285 for PEXP ($t = 3.091$, $p = 0.002$), 0.246 for EFEXP ($t = 2.302$, $p = 0.021$), and 0.254 for TRU ($t = 2.455$, $p = 0.014$), which support H1a, H1b, and H1c. The three magnitudes fall within a narrow band, which follows from TEC being specified as a single construct encompassing relative advantage, compatibility, complexity, and platform security. An item set covering all four attributes distributes its influence across the three perceptions rather than concentrating it on a single perception.

ORGC influences TRU at 0.202 ($t = 2.384$, $p = 0.017$), which supports H2c. Its effects on PEXP at 0.147 ($t = 1.738$, $p = 0.082$) and on EFEXP at 0.158 ($t = 1.575$, $p = 0.115$) do not reach the threshold, so H2a and H2b are not supported. The three ORGC coefficients are the smallest in Table 4. This result replicates the finding of Nagy, Arie et al. [39], whose SME sample found no significant effect of organizational factors on FinTech adoption, in contrast to literature that emphasized top management support and organizational readiness. It is also consistent with the resource profile of the firms sampled, since a small business operates a finance function in which the same individuals hold managerial commitment and internal readiness and are therefore reported as a single condition rather than two [36]. That ORGC retains a significant effect on TRU while failing on the other two perceptions indicates that internal governance signals credibility more than it shapes expectations of performance or ease of implementation.

ENVC returns the largest coefficient on each of the three perceptual constructs, at 0.347 for PEXP ($t = 4.292$, $p = 0.000$), 0.346 for EFEXP ($t = 3.856$, $p = 0.000$), and 0.400 for TRU ($t = 4.311$, $p = 0.000$), supporting H3a, H3b, and H3c. The effect on TRU is the largest coefficient in Table 4. This ordering reflects the framework's expectation that, when the buyer operating the financing arrangement is also the counterparty on the financed invoices, external pressure and institutional assurance exert stronger influence on supplier perceptions than conditions internal to the supplier firm.

All three perceptual constructs predict ISCF. PEXP returns 0.319 ($t = 3.424$, $p = 0.001$) and TRU returns 0.318 ($t = 3.021$, $p = 0.003$), which are close in magnitude, while EFEXP returns 0.228 ($t = 2.139$, $p = 0.033$). H4, H5, and H6 are supported.

Table 4. Empirical Results

Hypotheses	Path Coefficient (β)	T Values	P values
H1a: TEC $\rightarrow$ PEXP	0.285	3.091	0.002
H1b: TEC $\rightarrow$ EEXP	0.246	2.302	0.021
H1c: TEC $\rightarrow$ TRU	0.254	2.455	0.014
H2a: ORGC $\rightarrow$ PEXP	0.147	1.738	0.082
H2b: ORGC $\rightarrow$ EEXP	0.158	1.575	0.115
H2c: ORGC $\rightarrow$ TRU	0.202	2.384	0.017
H3a: ENVC $\rightarrow$ PEXP	0.347	4.292	0.000
H3b: ENVC $\rightarrow$ EEXP	0.346	3.856	0.000
H3c: ENVC $\rightarrow$ TRU	0.400	4.311	0.000
H4: PEXP $\rightarrow$ ISCF	0.319	3.424	0.001
H5: EEXP $\rightarrow$ ISCF	0.228	2.139	0.033
H6: TRU $\rightarrow$ ISCF	0.318	3.021	0.003

Note: EEXP = Effort Expectancy, ENVC = Environmental context, ORGC = Organizational context, PEXP = Performance expectancy, ISCF = Intention to use supply chain finance platforms, TEC = Technological context, TRU = Trust

The model specifies no direct path from TEC, ORGC, or ENVC to ISCF, so each antecedent's effect on the outcome is transmitted entirely through PEXP, EEXP, and TRU, and its total effect equals the sum of its three indirect pathways. Each pathway is the product of its constituent coefficients, and its significance is drawn from the same bootstrap distribution used for the direct paths [35]. Table 5 reports total effects of 0.317 for ENVC ($t = 4.519$, $p = 0.000$), 0.228 for TEC ($t = 2.896$, $p = 0.004$), and 0.147 for ORGC ($t = 2.433$, $p = 0.015$). The three values reproduce the sums of the corresponding coefficients in Table 4, confirming that no direct effects were estimated. The ordering repeats the first-stage ordering: ENVC has the largest total effect on ISCF, followed by TEC, then ORGC. ORGC reaches significance at the aggregate level despite two non-significant first-stage paths. The three pathways carry the same sign, so they combine into an aggregate effect whose bootstrap distribution excludes zero, whereas the smaller constituent pathways, taken singly, do not clear the same threshold.

Table 5. Total Effects

Hypotheses	Path Coefficient (β)	T Values	P values
ENVC $\rightarrow$ ISCF	0.317	4.519	0.000
ORGC $\rightarrow$ ISCF	0.147	2.433	0.015
TEC $\rightarrow$ ISCF	0.228	2.896	0.004

Note: EEXP = Effort Expectancy, ENVC = Environmental context, ORGC = Organizational context, PEXP = Performance expectancy, ISCF = Intention to use supply chain finance platforms, TEC = Technological context, TRU = Trust

3.3. Theoretical Implications

The study contributes to integrating the TOE framework with UTAUT by specifying the three contextual conditions as antecedents of user perceptions rather than direct predictors of behavioral intention. TOE explains organizational adoption in terms of technological, organizational, and environmental conditions, without specifying the perceptual route by which those conditions inform an adoption decision [9]. The present estimates supply that route. All three contexts reach ISCF entirely through PEXP, EFEXP, and TRU, and each context's total effect equals the sum of its indirect pathways, since no direct path was specified. The finding extends the integration Bouteraa [17] reported for bank consumers in the United Arab Emirates into an organizational setting, where the evaluating unit is a firm rather than an individual consumer. Gangwar, Date et al. [31] routed only technological and organizational variables through perceived usefulness and perceived ease of use and specified environmental variables as direct predictors of adoption, which left the perceptual standing of the environmental context unestimated in that specification. The present estimates place ENVC on the perceptual route and return the largest first-stage coefficient in the model on the ENVC-to-TRU path, establishing the environmental context as a perceptual antecedent rather than a direct determinant of intention.

The estimates apply to a post-adoption population, situating the contribution within research on continued use rather than initial acceptance. The separation of the two stages was established on individual users of a single organizational system [25], and the expectation-confirmation model of continuance was validated on individual online banking customers [26]. The present study extends this separation to an inter-organizational financing arrangement, where the unit forming the intention is a supplier firm, and the object of continued use is a platform commissioned by its buyer. TOE-based research on firm-level assimilation treats routinization as a stage governed by the same three contexts that govern adoption [27], and the present estimates specify the perceptual constructs through which those contexts reach continued platform use.

Combining the two frameworks raises a question of level, because TOE addresses the adopting organization while UTAUT addresses the individual user [15]. The present study resolves this by situating the perceptual constructs among managers who evaluate the platform on behalf of an employer, and the estimates show that the two frameworks cohere at that level. Ten of the twelve hypothesized relationships hold, and the contextual effects reach the outcome through the perceptual constructs without loss of significance. Organizational conditions and individual beliefs therefore operate as sequential stages of one decision rather than as competing explanations of the same decision.

The findings establish TRU as a construct equal in standing to PEXP in the setting examined, rather than an optional extension to UTAUT. TRU records a coefficient of 0.318 on ISCF against 0.319 for PEXP, and the ENVC to TRU estimate of 0.400 is the largest coefficient in the model. The original formulation of UTAUT does not include trust among its determinants of behavioral intention [15, 16, 68]. Consumer-level research has since extended the model to include trust and reported effects on both intention and use [45]. The present estimates extend that extension to a setting where the trusting party is a supplier firm and the object of trust is the handling of invoice-level records, so the extension is required in supply chain finance rather than merely permitted.

Awa, Ojiabo et al. [34] placed perceived trust within an integrated framework combining TAM, the theory of planned behavior, and TOE for SMEs, and derived propositions rather than estimates; the present study supplies the estimates their framework left open. Digital trust in supply chain finance is shaped by the quality of the provider's service [48], and the ENVC to TRU result adds that institutional conditions outside the provider also contribute to its formation.

The ORGC results identify a boundary condition on the TOE framework. TOE assigns the three contexts equal standing as sources of adoption, and the estimates show that the organizational context does not operate uniformly across the perceptual channels. ORGC influences TRU but not PEXP or EFEXP, so its contribution runs through credibility rather than expected performance or anticipated effort. This pattern aligns with the non-significant organizational effects reported among Hungarian and Indonesian SMEs [33], and it identifies the condition under which organizational context weakens: firms with few managerial layers, where commitment and readiness are held by the same personnel [36]. The refinement specifies the channel through which the organizational context operates rather than rejecting its relevance.

The ENVC results indicate that the antecedent hierarchy within UTAUT is setting-dependent. Meta-analytic evidence from consumer FinTech indicates that hedonic motivation and price value are among the antecedents most strongly related to use intention [44], and neither motivation arises when a finance manager evaluates a discount rate for an employer. In the present setting, the environmental context produces the largest coefficient on each of the three perceptual constructs and the largest total effect on ISCF. Supply chain finance is defined as working capital positions held jointly across trading partners rather than within a single firm, so the standing of external conditions in the model follows from the financing arrangement's structure.

This contribution fits within information systems research on inter-organizational systems. The three determinants Iacovou, Benbasat et al. [3] identified for electronic data interchange adoption by small firms entered their model as parallel influences, leaving the relations among them unspecified. The present estimates order them, since ORGC and ENVC operate on PEXP and TRU, and no context reaches ISCF except through a perception. Trust measurement in information systems was developed for consumers facing an

unfamiliar web vendor [69], where the trusting party holds no prior relationship with the trustee. In the present setting, the trusting party has a trading relationship with the buyer who commissions the platform, so the object of trust is the handling of records already exchanged for commercial purposes rather than the character of an unknown vendor.

3.4. Practical Implications

The results carry consequences for the parties that operate, join, and regulate online SCF platforms. Because the model specifies no direct path from TEC, ORGC, or ENVC to ISCF, every condition reaches adoption through what suppliers come to believe about the platform. An intervention that alters the objective conditions without moving PEXP, EFEXP, or TRU will not raise participation.

For SME finance and supply chain managers, the proximity of the PEXP and TRU coefficients on ISCF indicates that an adoption decision rests as much on confidence in the platform operator as on the financial case for early settlement. Managers evaluating an online SCF platform can therefore treat the provider's security architecture, data-handling commitments, and contractual protections as decision criteria on par with the discount rate. The financial case remains calculable, since SCF arrangements address working capital held in accounts payable, accounts receivable, and inventory [2]. A favorable discount rate alone does not produce adoption intention without confidence in the operator.

The ORGC results qualify a common managerial prescription. Internal readiness and top management support did not significantly raise PEXP or EFEXP in the present sample, and ORGC influenced only TRU. Managers should not expect internal training programs and capability-building alone to generate adoption intention, as the same pattern emerged among Hungarian and Indonesian SMEs, where organizational factors did not significantly predict FinTech adoption [39]. Small firms' resource profiles limit what internal programs can change, because the personnel who would operate the platform already have other responsibilities. Management commitment retains value through a different channel, since it signals the firm's capacity to govern the exposure created by platform participation.

Platform providers and the corporate buyers who commission early payment programs hold the levers with the largest estimated effects. ENVC produced the largest coefficient on each perceptual construct and the largest total effect on ISCF, and the buyer operating the program is also the counterparty on the financed invoices. Buyers can therefore raise supplier participation more effectively through the terms and communication of their own programs than through appeals to supplier readiness. TRU in supply chain finance settings transmits across trading relationships rather than forming in isolation, so a buyer's standing with its established suppliers extends to the platform it commissions [32]. For providers, the TEC results identify integration with installed accounting and enterprise resource planning systems and demonstrable security controls as

the design features that drive all three perceptions, and the quality of service provision itself determines digital trust in supply chain finance [48].

For policy-makers, the model's largest single coefficient runs from ENV C to TRU, placing regulatory and institutional design at the point where supplier confidence forms. Legal protection for financial data and enforceable rules on electronic payment modification supply assurances that no individual provider can offer about itself, and government support has been found to operate alongside trust in shaping FinTech adoption [41]. Agencies supporting SME digitalization can therefore direct resources toward the legal and infrastructural conditions that make participation credible, rather than solely toward firm-level readiness grants. Comparative differences in FinTech development across Taiwanese municipalities indicate that such conditions are unevenly distributed within a single national market [6], so support calibrated to local conditions addresses gaps left by uniform national programs.

4. CONCLUSION

The three contexts of the TOE framework reach a supplier firm's intention to continue using an online SCF platform entirely through PEXP, EFEXP, and TRU, and ten of the twelve hypothesized relationships are supported. TEC influences all three perceptual constructs within a narrow band of coefficients; ENV C returns the largest coefficient on each of them, and the largest single coefficient in the model on its path to TRU at 0.400, and ORGC influences TRU alone at 0.202 while its effects on PEXP and EFEXP do not reach the significance threshold. All three perceptual constructs predict ISCF, with PEXP at 0.319 and TRU at 0.318 close in magnitude and EFEXP the smallest at 0.228. The total effects are ordered as ENV C at 0.317, TEC at 0.228, and ORGC at 0.147, reproducing the first-stage ordering and confirming that no context reaches the outcome except through perception. The three sets of estimates answer the study's three objectives in the order stated.

Three results carry the contribution. TRU matches PEXP in magnitude in a setting where participation requires disclosing invoice records to a counterparty, establishing the construct as a required extension of UTAUT in supply chain finance rather than an optional addition. The ENV C, specified as an antecedent of perceptions rather than a direct predictor of intention, shows the strongest influence on every perception, reflecting an arrangement in which the buyer commissioning the platform is also the counterparty on the financed invoices. The ORGC operates on credibility alone, which qualifies the prescription that internal readiness and top management support determine adoption among small firms and directs managerial effort toward the perceptions on which supplier participation depends.

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