Cardano-Based Crowdfunding for Undergraduate Final-Year Projects: Donor Adoption Analysis and System Design

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ABSTRACT

Undergraduate final-year projects need funds for hardware, software licenses, materials, and prototyping, yet small student projects rarely qualify for conventional finance. Reward-based crowdfunding is an alternative, but donors have little assurance that their money is used for the project once a campaign closes. Blockchain-based crowdfunding has been studied, but few studies link donor-side adoption evidence to the design of milestone-controlled systems. This study surveyed 169 donors in Sri Lanka, recruited through purposive and snowball sampling, and analyzed the data with partial least squares structural equation modeling (PLS-SEM), using the Unified Theory of Acceptance and Use of Technology (UTAUT) extended with perceived risk as a moderator. Effort expectancy was the only significant predictor of behavioral intention to adopt the platform, but its effect was negative ($\beta = -0.206$, $p = .011$), which is opposite to the hypothesized positive effect. Performance expectancy, social influence, and

facilitating conditions were not significant, and perceived risk moderated none of the four paths. The model explained little variance in intention ($R^2 = .131$) and had no out-of-sample predictive relevance ($Q^2predict = -0.004$). Because no UTAUT factor emerged as an adoption lever, the preliminary Cardano-based design treats milestone-controlled release of funds as a baseline accountability requirement rather than as a proven driver of giving: donations in ADA are locked by a smart contract, each tranche is released only when an authorized university verifier approves the milestone, and EDUF acknowledgment tokens are minted at 10 EDUF per ADA. The design is presented as a rationale derived from the survey and the literature, not as an evaluated system. The ledger makes contributions and releases verifiable, but milestone verification remains a trust point that the blockchain does not remove.

Keywords: *Blockchain, Cardano, Crowdfunding, Smart Contracts, UTAUT*

1. INTRODUCTION

Undergraduate final-year projects incur costs for hardware, software licenses, laboratory items, data collection, and prototype testing, and funding shortfalls lead to reduced scope, delays, and weaker learning outcomes (Brew & Mantai, 2017). Bank credit, equity finance, and institutional grants are designed for established borrowers, so early-stage, noncommercial work without collateral or a track record is rarely eligible (Ayyagari et al., 2011; World Bank, 2022). Crowdfunding raises small amounts from a large online community and has financed early-stage projects that institutional finance overlooks (Mollick, 2014). Its reward-based form suits student projects because contributions are neither repaid nor exchanged for equity (Belleflamme et al., 2014), and success depends on the quality of project information, the creator's network, and the trust that backers place in the platform (Shneor & Vik, 2020).

The main weakness of reward-based crowdfunding is the lack of transparency after funding. On centralized platforms, progress reporting is voluntary, and the use of funds is hard to verify once a campaign closes. This uncertainty raises the perceived risk of giving online and lowers participation (Cumming et al., 2020; Gefen et al., 2003). Distributed ledgers provide a tamper-resistant, independently verifiable record of transactions, and smart contracts can enforce agreed disbursement rules without relying on a single custodian (Zheng et al., 2018). Tying the release of funds to verified milestones therefore promises greater accountability, although someone must still confirm that progress has occurred in the real world.

Cardano is suited to such a design. Its proof-of-stake Ouroboros protocol (Kiayias et al., 2017) and its extended unspent transaction output (eUTXO) ledger allow scripts to validate escrow-style spending conditions and support native tokens issued under a minting policy (Chakravarty et al., 2020). Research on blockchain crowdfunding has mapped its potential and its risks (Block et al., 2021; Rejeb et al., 2025), and adoption studies show that information quality and trust shape intention to use

blockchain-based crowdfunding (Behl et al., 2024). In Sri Lanka, crowdfunding research has focused on small and medium-sized enterprises and potential entrepreneurs, for whom perceived usefulness, ease of use, trust, and perceived desirability shape intention (Deepika, 2025; Deepika et al., 2023; Fernando & Pretheeba, 2024). Nguyen et al. (2021) showed that blockchain-based social crowdfunding can create social value through transparency. However, these studies rarely examine donors, rarely consider undergraduate projects, and rarely connect adoption findings to the design of milestone-controlled systems.

This study addresses that gap. It surveys donors in Sri Lanka using an extended UTAUT model and uses the results, together with the literature, to derive requirements for a preliminary Cardano-based crowdfunding architecture for undergraduate final-year projects. The study distinguishes clearly between what the survey shows and which design choices are proposed on the basis of design reasoning.

2. AIMS/OBJECTIVES

This study aims to explain donor adoption of a blockchain-based crowdfunding platform for undergraduate final-year projects and to translate the findings into system requirements. Its objectives are to identify which factors predict donors' intention to adopt such a platform, to test whether perceived risk changes these relationships, and to derive design requirements for a milestone-controlled Cardano architecture. Three research questions (RQs) follow:

RQ1: Which factors predict donors' intention to support final-year projects through a blockchain-based crowdfunding platform?

RQ2: Does perceived risk moderate these relationships?

RQ3: How can the results inform the requirements of a Cardano-based crowdfunding architecture?

3. THEORY

The Unified Theory of Acceptance and Use of Technology (UTAUT) integrates eight earlier acceptance models into four determinants of behavioral intention: performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC) (Venkatesh et al., 2003). In this study, PE is the degree to which donors believe the platform helps them support worthwhile projects effectively, EE is the ease of using the platform and its wallet, SI is the extent to which important others expect donors to use it, and FC is the availability of resources and support. The dependent variable is donors' behavioral intention to adopt the platform (BI), referred to as adoption intention. UTAUT is widely used, but a meta-analysis shows that its predictive power varies across contexts and that PE is usually its strongest predictor (Blut et al., 2022).

Perceived risk (PR) is the uncertainty that a user associates with a transaction. Featherman and Pavlou (2003) distinguish financial, privacy, and performance risk, among other facets, and show that these facets reduce the adoption of electronic services. Giving money through an unfamiliar financial technology is uncertain, so PR is a common extension in blockchain adoption research (Norbu et al., 2024; Ullah et al., 2021). When PR is high, the benefits and ease of a platform may not translate into intention to give, because donors weigh possible losses against expected value. PR is therefore modeled as a moderator of the four UTAUT paths rather than only as a direct antecedent.

In the research model (Figure 1), H1–H4 propose that PE, EE, SI, and FC positively influence BI, and H5–H8 propose that PR moderates each of these four paths. Because UTAUT was developed for users who adopt technology for their own tasks, its fit for voluntary giving is itself an open question that the study tests.

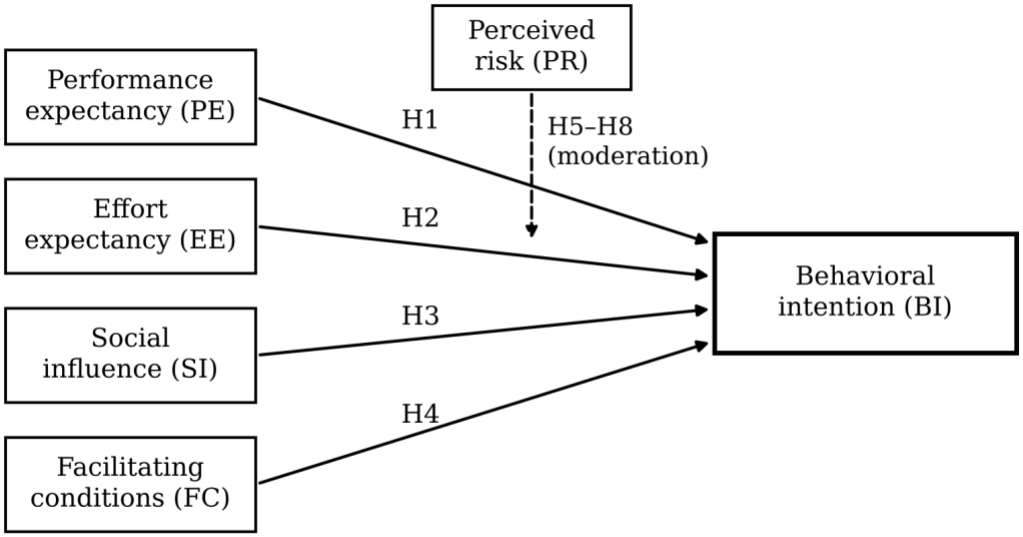

Figure 1. Research Model with Perceived Risk as a Moderator (H1–H8)

Source: Authors, based on Venkatesh et al. (2003) and Featherman and Pavlou (2003).

4. METHODS

4.1. Research Design, Sampling, and Data Collection

The study followed a pragmatist, design-oriented approach that combined an adoption survey with system design (Creswell & Creswell, 2018). The unit of analysis was the donor, because campaign success depends on donors' willingness to give. The population consisted of existing and potential donors in Sri Lanka in four groups: individual donors, university alumni, industry professionals in

technology, engineering, banking, and finance, and corporate social responsibility (CSR) representatives.

Because no register of such donors exists, purposive and snowball sampling were used. The online questionnaire was distributed through university alumni networks, LinkedIn and other professional networks, corporate CSR contacts, and personal networks, and respondents were invited to forward it to other donors. Eligibility was assessed with a screening question: only respondents who had donated to a cause in the last three years or who would consider funding a student project were retained. The four donor groups were not sampled by quota; their shares are reported in Section 5.1.

The minimum sample size was set by the part of the model with the most predictors. In the full moderation model, nine predictors point to BI: the four UTAUT constructs, PR, and the four interaction terms. A G*Power calculation for a multiple regression with nine predictors ($f^2 = 0.15$, $\alpha = .05$, power = .95) gave a minimum of 166 cases (Faul et al., 2009), which is stricter than the ten-times rule of 90 cases (Hair et al., 2019). A target of 200 responses was therefore set. Of the 200 responses received, 31 did not meet the screening criterion, leaving 169 usable cases, which is above the minimum of 166.*

4.2. Measurement Instrument

The questionnaire had three parts: a donor profile, giving behavior and interest in funding student projects, and 42 measurement items rated on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree). A short explanation of blockchain-based crowdfunding preceded the items so that respondents unfamiliar with blockchain could answer meaningfully. The items were adapted to the context of a donor deciding whether to fund student projects. PE had 10 items covering perceived usefulness, job fit, and relative advantage; EE had six items covering ease of use and complexity; SI had six items covering social factors and subjective norm; FC had seven items covering compatibility and perceived behavioral control; and BI had three items (Davis, 1989; Venkatesh et al., 2003). PR had 10 items covering financial risk (for example, losing the donation if a project fails), privacy risk (misuse of personal and wallet data), and performance risk (the platform or smart contract not working as intended), adapted from Featherman and Pavlou (2003). The three complexity items in EE were reverse-coded. The instrument was pilot-tested with a small group of alumni and industry donors, and item wording was adjusted. Appendix A summarizes each construct, its sources, and the items retained.

4.3. Data Analysis

Data were screened in SPSS for missing values, straight-lining, reverse coding, outliers, and normality. Common method bias was assessed with Harman's single-factor test (Podsakoff et al., 2003). The model was estimated with PLS-SEM in SmartPLS 4, which suits predictive models with moderation and does not require multivariate normality (Hair et al., 2019). The measurement model was assessed

against these thresholds: outer loadings of at least 0.708 (with loadings between 0.40 and 0.708 retained if reliability and convergent validity were met), Cronbach's α of at least .70 (Cronbach, 1951), composite reliability (CR) of at least .70, average variance extracted (AVE) of at least .50 (Fornell & Larcker, 1981), and heterotrait–monotrait ratio (HTMT) values below .85 (Henseler et al., 2015). The structural model was assessed through inner-model variance inflation factors (VIF), path coefficients (β) with two-tailed p values and 95% bootstrap confidence intervals (CIs, reported for the significant and unstable paths) from bootstrapping with 5,000 subsamples, R^2, f^2, and out-of-sample predictive relevance using PLSpredict with 10 folds and 10 repetitions (Q^2predict; Shmueli et al., 2019). Moderation (H5–H8) was tested with the two-stage approach, in which latent variable scores from the main-effects model are used to form the interaction terms; simple-slope analysis was planned for any significant interaction.

4.4 Derivation of Design Requirements

Design requirements were derived from three sources: donor trust problems reported in the literature, the donor concerns represented in the questionnaire items (for example, wallet set-up effort within EE and loss of funds within PR), and the survey results. Each concern was mapped to a requirement and then to an architectural response (Table 3). Where the related survey factor was not significant, the requirement was retained only if the literature supported it, and the table states this. The mapping is a design rationale; the effect of each response on adoption was not tested.

5. RESULTS

5.1 Sample Profile and Data Screening

Of the 200 responses, 31 respondents had not donated to a cause in the last three years and would not consider funding a student project, so they were excluded. The 169 usable responses had no missing values and no straight-lining patterns, and no further cases were removed. After reverse coding, item skewness ranged from −0.53 to −0.20 and excess kurtosis from −0.85 to 0.03, all within ±1. The first unrotated factor explained 12.17% of the variance, well below 50%, so common method variance is unlikely to bias the results.

Of the 169 respondents, 32.5% were alumni, 30.2% individual donors, 19.5% CSR representatives, and 17.8% industry professionals. More than half (53.8%) had donated to a cause in the last three years, and 46.2% had used a crowdfunding platform. Most respondents (53.3%) were not familiar or only slightly familiar with blockchain technology. When asked whether they would support a final-year project, 43.8% of the 169 respondents answered yes, 40.2% answered maybe. The most common affordable contribution was less than LKR 5,000 (30.2%), and 31.4% of respondents said they required no reward.

5.2 Measurement Model

With all 42 items included, PE, EE, SI, FC, and PR did not reach an AVE of .50. Items with loadings below 0.40 were removed first, and the remaining items with the lowest loadings were then removed one at a time, with the model re-estimated each time, until every construct reached an AVE of .50. Of the 42 items, 28 were retained (Table 1; Appendix A). Retained outer loadings ranged from 0.506 to 0.999, and 12 loadings between 0.40 and 0.708 were retained because their constructs met the reliability and convergent validity criteria. Cronbach's α ranged from .757 to .830, CR from .778 to .867, and AVE from .509 to .686. The highest HTMT value was .268 (EE–BI), and the Fornell–Larcker criterion was met.

Two features of the measurement model need explanation. First, the SI composite is dominated by a single item with a loading of 0.999, and the CR of SI is lower than its α. After item deletion, SI is therefore effectively measured by one indicator, which limits its interpretation and explains why the SI path was unstable across bootstrap samples. Second, the low maximum HTMT does not indicate a measurement error; it reflects the weak correlations among the constructs, which are consistent with the low explanatory power of the structural model. Item deletion also reduced the content coverage of PE, SI, and PR, so these constructs represent narrower versions of their original definitions.

Table 1. Reliability, Validity, and Descriptive Statistics

Construct	Items	α	CR	AVE	Mean	SD
Performance expectancy (PE)	5/10	.779	.835	.515	3.24	0.72
Effort expectancy (EE)	5/6	.757	.838	.509	3.19	0.70
Social influence (SI)	3/6	.806	.778	.557	3.17	0.82
Facilitating conditions (FC)	6/7	.830	.862	.512	3.20	0.76
Perceived risk (PR)	6/10	.827	.862	.512	3.26	0.72
Behavioral intention (BI)	3/3	.784	.867	.686	3.22	0.78

Note. N = 169. Items = retained/original. Mean and SD are for the unweighted mean of the retained items on a 1–5 scale. α = Cronbach's alpha; CR = composite reliability; AVE = average variance extracted. Source: Authors' survey data.

5.3. Structural Model

Inner VIF values ranged from 1.007 to 1.072 for the main effects and did not exceed 1.135 with the interaction terms, so collinearity was not a concern. The full model explained 13.1% of the variance in BI ($R^2 = .131$, adjusted $R^2 = .082$), and the main-effects-only model explained 10.8%. Q^2predict for BI was −0.004, indicating no out-of-sample predictive relevance (Table 2).

PE ($\beta = -0.099$, $p = .271$), SI ($\beta = 0.179$, $p = .264$), and FC ($\beta = 0.119$, $p = .327$) had no significant effect on BI, so H1, H3, and H4 were not supported. EE had a significant effect in the direction opposite to the hypothesis ($\beta = -0.206$, $p = .011$, 95% CI [−0.358, −0.054], $f^2 = 0.045$, a small effect). Because H2 predicted a positive

effect, H2 was not supported. PR had no direct effect on BI (β = 0.026, p = .836), and none of the four interaction terms was significant (all p > .18), so H5–H8 were not supported and no simple-slope analysis was needed. The SI estimate was unstable (95% CI [−0.291, 0.330]) because it rests on a single item. As the data are cross-sectional, the paths represent associations rather than causal effects.

Table 2. Structural Model Results (Bootstrapping, 5,000 Subsamples)

H	Path	β	t	p	f^2	Result
H1	PE → BI	−0.099	1.105	.271	0.011	Not supported
H2	EE → BI	−0.206	2.579	.011	0.045	Not supported (opposite direction)
H3	SI → BI	0.179	1.122	.264	0.033	Not supported
H4	FC → BI	0.119	0.983	.327	0.015	Not supported
–	PR → BI	0.026	0.207	.836	0.001	–
H5	PR × PE → BI	−0.005	0.056	.955	0.000	Not supported
H6	PR × EE → BI	0.038	0.408	.684	0.002	Not supported
H7	PR × SI → BI	0.015	0.166	.869	0.000	Not supported
H8	PR × FC → BI	−0.148	1.318	.189	0.025	Not supported

Note. R^2(BI) = .131, adjusted R^2 = .082, Q^2predict = −0.004. Two-tailed tests. Confidence intervals for the significant EE path and the unstable SI path are reported in the text. Not supported = the hypothesis was not supported. Opposite direction = the effect was significant (p < .05) but negative, whereas the hypothesis predicted a positive effect. Source: Authors' analysis in SmartPLS 4.

5.4 Preliminary System Design

Table 3 maps donor concerns to requirements and architectural responses, with milestone-controlled release as the core requirement. The design has four layers. A presentation layer provides dashboards for students, donors, verifiers, and administrators. Donors sign transactions in a browser wallet that follows the Cardano CIP-30 wallet standard, so private keys are never entered on the platform. An application layer manages campaigns, milestones, contributions, and verification and builds blockchain transactions. An off-chain database stores user, campaign, and milestone records. Only financial events are recorded on-chain: contributions, releases, the ADA held at the escrow validator's script address, and the minting of EDUF, the platform's acknowledgment token.

In the fund-control lifecycle (Figure 2 and Algorithm 1), a donor connects a wallet and contributes A ADA, the native currency of Cardano. In the same transaction, the ADA is locked at the escrow validator's script address and the minting policy issues 10A EDUF to the donor, so EDUF cannot be issued unless the corresponding ADA is locked. When a student submits evidence for a milestone and the authorized university verifier approves it, the validator releases only that milestone's allocation to the student's address, and the funds for later milestones stay locked.

The verifier is a staff member appointed by the student's faculty, whose wallet key is registered to the campaign; approval is a signed transaction, so every decision is

recorded and attributable. If the verifier rejects the evidence, the student may resubmit, and the design specifies that a disputed rejection is referred to a second faculty reviewer. If a project is abandoned or misses its final milestone deadline, the unreleased ADA is returned to donors in proportion to their contributions. The rate of 10 EDUF per ADA is a fixed, easily understood ratio; EDUF serves only as a record of acknowledgment, has no claimed monetary value, return, or tradability, and is not an incentive to invest. Because ADA prices change, each contribution and allocation is shown in LKR at the time of contribution, and donors are told before giving that the LKR value of locked ADA may change before release.

Implementation status should be read precisely. The campaign, donation, and milestone workflows were implemented off-chain in a full-stack web prototype (React, TypeScript, Tailwind CSS, TanStack Start, and MongoDB), and test transactions were submitted on the Cardano Preprod test network. The escrow validator, the minting policy, the dispute route, and the refund rule are specified at the architectural level only. No usability, security, cost, or performance evaluation is reported, so the architecture is a preliminary design rather than an evaluated solution.

Table 3. Derivation of Design Requirements

Donor concern	Survey evidence	Requirement	Architectural response
Opacity after funding	Literature (Cumming et al., 2020)	Verifiable financial record	Contributions and releases as on-chain transactions
No control over use of funds	Literature (Gefen et al., 2003)	Conditional custody	Escrow validator holds ADA
Loss if a project fails (PR)	PR → BI and moderation NS; retained from literature	Staged disbursement and refund rule	Milestone allocations; unreleased ADA returned pro rata
Wallet set-up effort (EE, FC)	EE significant but negative; FC NS; 53.3% low blockchain familiarity	Lower entry barrier	Guided wallet connection; service layer builds transactions
Personal data exposure (PR)	PR NS; retained from literature (Finck, 2018)	Minimal on-chain data	Only financial events on-chain
ADA price movement (PR)	PR NS; retained as disclosure	Value visibility	Amounts shown in Sri Lankan rupees (LKR) with a volatility notice
Recognition of contributors	31.4% required no reward	Transparent acknowledgment	10 EDUF minted per ADA, as acknowledgment only
Wrong or disputed approval	Literature (Caldarelli, 2020)	Accountable verification	Registered verifier key; second reviewer for disputes

Note. PR = perceived risk; EE = effort expectancy; FC = facilitating conditions; NS = the related survey path was not significant. Source: Authors.

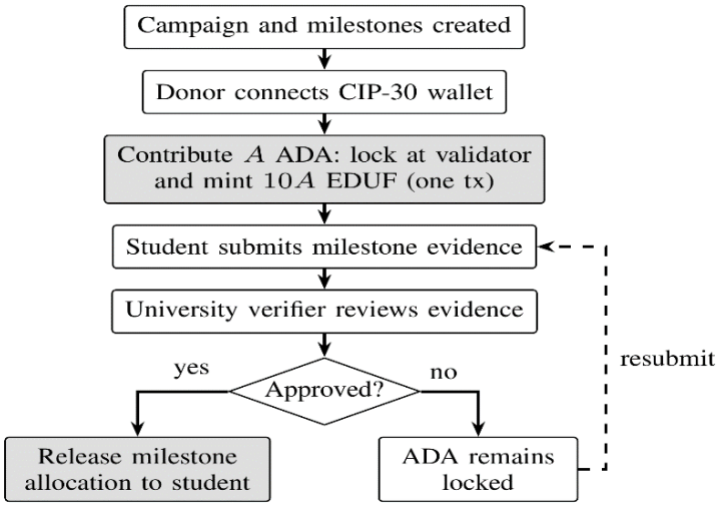

Figure 2. Milestone-Controlled Fund Release (Shaded Steps Are On-Chain Transactions)

Source: Authors.

Algorithm 1. Milestone-Controlled Fund Release (Architectural Pseudocode)

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Require: campaign C with milestones M1…Mk, allocations a1…ak, registered verifier V
  1: on contribution of A ADA by donor D do
        2: lock A at the escrow script of C; mint 10A EDUF to D (one transaction)
  3: end on
  4: on submission of evidence for milestone Mi do
        5: if V approves Mi (signed transaction) then
              6: release ai to the student address (on-chain transaction)
        7: else retain ai under the escrow script; allow resubmission or referral to a second
        reviewer
        8: end if
  9: end on
  10: on abandonment or a missed final deadline do
       11: return unreleased ADA to donors in proportion to their contributions
  12: end on
```

Source: Authors.

6. DISCUSSION

The extended UTAUT model received little support in this donor context. PE, SI, and FC were not related to BI, and the model explained only 13.1% of the variance in intention and had no out-of-sample predictive relevance. This is far below the explanatory power typically reported in UTAUT research (Blut et al., 2022; Venkatesh et al., 2003). In particular, PE, which meta-analytic evidence identifies as the strongest UTAUT predictor (Blut et al., 2022), was not significant. One interpretation is that donors do not evaluate a giving platform in the utilitarian terms that users apply to technology they use for their own tasks. The nonsignificant SI

path is consistent with the voluntary nature of giving, because in the original UTAUT study social influence mattered mainly when use was mandatory (Venkatesh et al., 2003).

The only significant path, from EE, was negative: donors who found the platform easier to use reported slightly lower intention. This finding should be treated as tentative rather than as evidence that ease of use deters giving. The effect is small, it is one of nine tests, and the model as a whole has no predictive relevance, so the result may not replicate. A possible explanation is that respondents who found the platform easy had more experience with digital finance and were more critical of new blockchain services, but the study did not test this. Unlike blockchain payment research in which risk shapes intention (Norbu et al., 2025), PR neither moderated any path nor affected intention directly. Respondents evaluated a described platform rather than a working one, which may have made its risks less concrete.

The methods also limit what can be concluded. The UTAUT constructs combine sub-dimensions from different models, and item deletion narrowed PE, SI, and PR, so the nonsignificant paths may partly reflect measurement rather than the absence of a relationship. Compared with Sri Lankan crowdfunding studies, which found that usefulness, ease of use, and trust predicted intention among entrepreneurs and SMEs (Deepika et al., 2023; Fernando & Pretheeba, 2024), the present results suggest that donors may respond to different motives, such as altruism, trust in the institution, or ties to the university, which UTAUT does not capture.

Because no predictor was significant in the hypothesized direction, the survey does not provide an empirical ranking of the design requirements, and its implications for design are limited. Guided wallet set-up remains relevant because more than half of the respondents had little familiarity with blockchain; the negative EE path shows only that ease of use alone will not motivate giving. Milestone-based release, university verification, and on-chain transaction links remain baseline accountability measures supported by the literature rather than proven adoption levers. Finally, because 31.4% of respondents required no reward, EDUF is better positioned as an acknowledgment than as a principal incentive.

7. IMPLICATIONS AND LIMITATIONS

For theory, the results suggest that UTAUT alone does not explain donors' intention to give through a blockchain platform. Future models should include donor-specific constructs such as altruism, trust in the verifying institution, and attachment to the university. For practice, conditional escrow, verified milestones, and public financial records offer a design response to donors' accountability concerns, and universities considering such a platform would need to define the verifier's role, workload, and accountability. However, on-chain records cannot verify real-world progress. Inaccurate evidence or a dishonest verifier would still lead to release, so the design is not fully decentralized. Self-custody makes wallet compromise a donor risk, and

ADA volatility changes the real value of escrowed funds, which the LKR display makes visible but does not remove.

The study has several limitations. Non-probability sampling limits generalization to all donors in Sri Lanka or elsewhere. The measures were self-reported at one point in time and captured intention rather than actual donations. Item deletion narrowed construct coverage, and SI rests largely on one item. At the system level, the correctness, security, transaction costs, latency, and usability of the design remain to be evaluated, and the regulatory treatment of ADA and EDUF was outside the scope of the study. Future research should implement and test the validator and minting policy on the Preprod test network, measure cost, latency, and usability, observe actual giving, replicate the survey with donor-specific constructs, and examine verifier governance.

8. CONCLUSION

This study surveyed 169 donors in Sri Lanka and used the results to derive requirements for a Cardano-based crowdfunding architecture for undergraduate final-year projects. For RQ1, none of the four UTAUT constructs positively predicted donors' intention; EE was negatively related to intention, and the model had low explanatory power and no predictive relevance. For RQ2, perceived risk did not moderate any relationship. For RQ3, because the survey did not identify an adoption lever, the design draws on the literature and treats milestone-controlled release, verified university approval, minimal on-chain data, LKR value display, and EDUF acknowledgment as baseline requirements. The survey findings and the proposed architecture are therefore different kinds of contribution: the first is empirical evidence about donors, and the second is a preliminary design that still requires technical and user evaluation.

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