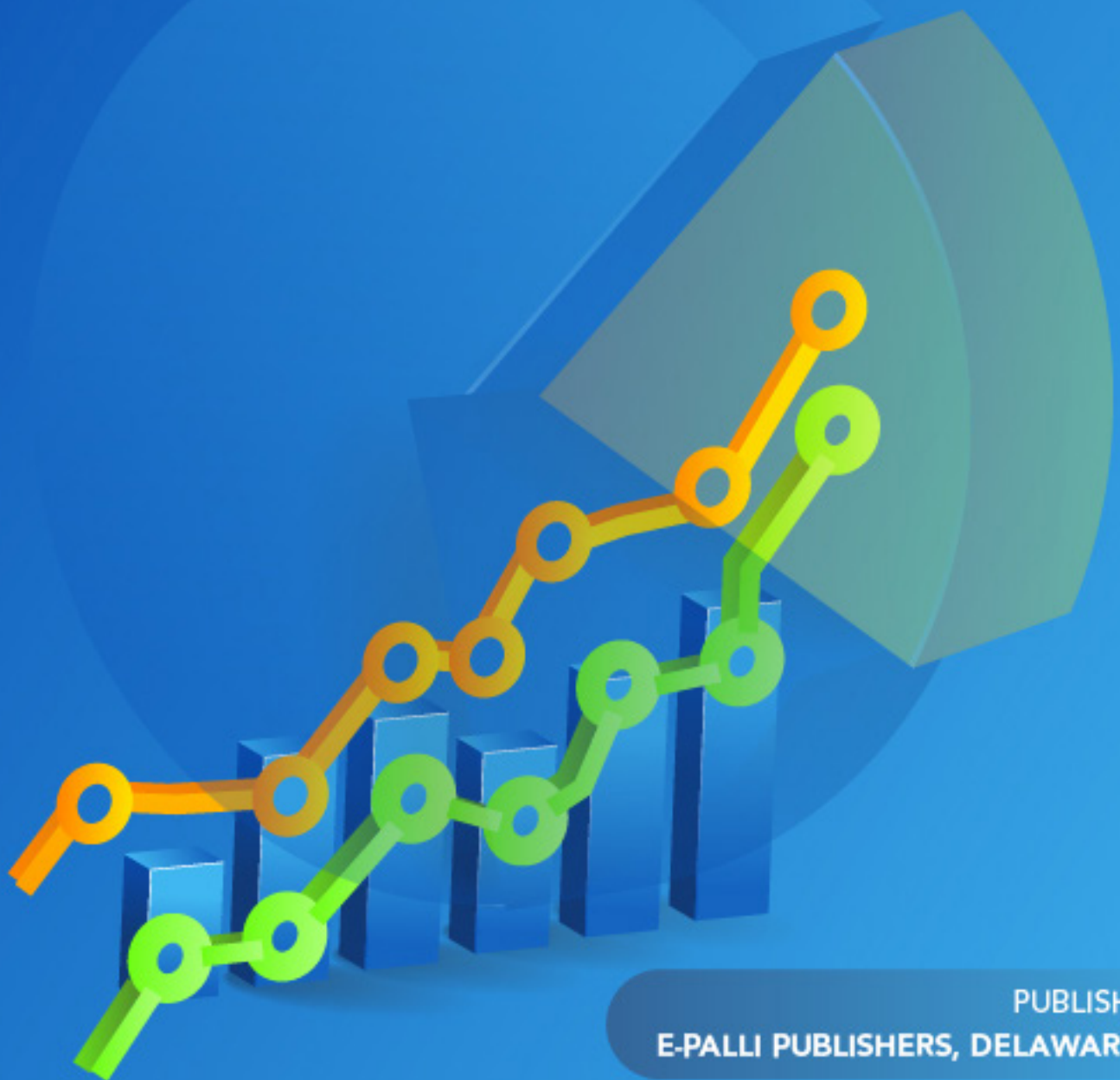




American Journal of Applied Statistics and Economics (AJASE)

ISSN: 2992-927X (ONLINE)

VOLUME 5 ISSUE 2 (2026)



PUBLISHED BY
E-PALLI PUBLISHERS, DELAWARE, USA

The Economics of “Free”: How Zero-Price Effects, Perceived Opportunity Cost, and Transaction Utility Shape Digital Purchase Decisions

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Article Information

Received: June 29, 2026

Accepted: September 03, 2026

Published: October 02, 2026

Keywords

*Digital Purchase Decision,
Freemium, Perceived Opportunity
Cost, Pls-Sem, Transaction Utility,
Zero-Price Effect*

ABSTRACT

Online markets have made it a standard to have free trials, freemium, zero-cost downloads, and massively discounted entry offers but the behavioural processes by which such offers influence or affect the decision to purchase have not been adequately integrated. The paper observes the effects of the zero-price effect and perceived opportunity cost on digital purchase behavior both directly and indirectly (via transaction utility). A cross-sectional survey generated 410 valid surveys on adults who have had recent experience of digital products and services. The 24 five-point Likert items were used to measure four reflective constructs and analysed using partial least squares structural equation modelling. The measurement model was found to be highly reliable in terms of indicators, internal consistency, convergent validity and discriminant validity. Full-collinearity and inner variance inflation factors were not critical. The structural findings have revealed that the perception of zero price has a positive effect of enhancing both the transaction utility and other digital purchases decisions, and that opportunity cost is perceived as a negative effect of both the outcome. The purchase utility of transaction has a positive impact on digital purchasing decisions and has a strong indirect impact on both antecedents. The model has a predictive relevance of both the endogenous constructs as has illustrated a positive proportion of the variance in the transaction utility and digital purchase decision as stood at 43.29 percent and 55.18 percent respectively. The results align transaction utility as a pivotal psychological process between price framing, perceived sacrifice, and online consumer decision-making.

INTRODUCTION

Consumption of digital products has changed a significant portion of market exchange to access, subscription, licensing, downloading, and platform-mediated utilization. Consumers are more and more choosing between streaming options, software, mobile phones, online courses, games, cloud storage, e-books, and premium content. In these contexts, the presentation of prices is not a marginal marketing mechanism (Ashrafimoghari & Suchow, 2022). It influences how consumers perceive an offer, whether they become aware of it, and whether they do trial to adoption, or payment. With the popularity of free trials and the freemium model, the economics of zero is particularly significant since a price of zero still seems psychologically distinct to a lower price.

Free offer in the digital form may eliminate an instant monetary loss and decrease resistance. It may motivate customers to try on products that they were not intending to purchase, get more attention on the possible benefits and form a perception of positive value. Nevertheless, digital products are seldom free in the bigger picture (Gasanov *et al.*, 2022). Apparently free consumption can be accompanied by time, attention, advertisements, exposure to privacy, sharing of data, effort in learning, switching costs and loss of better alternatives (Ayu, 2023). The behavioural impact of zero price therefore, is not only related to the monetary sacrifice but also the

existence of the opportunity costs in the decision.

Specifically in the digital marketplace, this tension is also pertinent since consumers have a large amount of alternatives they can compare at little search cost and simultaneously encounter intricate non-monetary trade-offs (Fokina & Mottaeva, 2023). The free platform can be accepted and rejected at some point by a user due to the initial perception of attractiveness by the absence of payment, but then the user may turn away or accept it later, which is due to advertisements or privacy implications, restricted functionality or time demands. Similarly, a low-cost paid service might be chosen over a free one, where the paid one has more functionality, fewer risks or less concealed cost (Villalobos Monge *et al.*, 2020). The full picture of the digital buy behaviour thus necessitates the attraction produced by zero prices as well as the sacrifice in the form of perceived opportunity cost.

These influences can be linked with the help of transaction utility. It is a measure of psychological satisfaction of having got a deal that seems better than an expected or reference price (Zam *et al.*, 2022). In online buying, utility of a transaction may occur when a valuable service is provided at no cost, when a discount is greater than expected, or when the advantages seem to offset monetary and non-money expenses. It is different to the underlying practical utility of the product since it deals with the appeal of the very transaction (Summers, 2023). This difference matters in describing the reason why

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consumers are able to react favorably to an offer despite not having the long-term performance of the product assessed.

The current research incorporates zero-price effect, perceived opportunity cost, transaction utility, and digital purchase decision as a single structure model. Zero-price effect and perceived opportunity cost is considered as exogenous construct, transaction utility as mediator, and digital purchase decision as endogenous construct (Lowens, 2023). The experiment measures direct effects on transaction utility and purchase decision in combination with two kinds of indirect effects via transaction utility (Lowens, 2023). This construction enables the analysis to discard whether consumers are reacting to free offers as a result of zero price having a direct effect of prompting them to acquire, or as a result of zero price being more psychologically valuable than a non-zero price deal.

The research is valuable in three aspects. First, it does not analyze price framing independently, but rather puts an attraction mechanism and a sacrifice mechanism in the same empirical model (Wellbrock & Buschow, 2020). Second, it explains that transaction utility mediates between deal evaluation and behavioural intention, making a link between deal evaluation and behavioural intention. Third, it presents evidence based on a modern digital-consumer sample of diverse product types, payment options and frequency of purchases (Haghpour *et al.*, 2022). The resulting model provides a simplified explanation of the interpretation of the meaning of free by consumers and yet it does consider the opportunity costs that may balance out the attractiveness of free.

LITERATURE REVIEW

Zero-Price Effect in Digital Markets

The zero-price effect explains the unproportional change in attractiveness which may arise when a price shifts to zero, after it has moved to a small positive level (Maguire *et al.*, 2023). The ordinary economic logic would foresee an equal reaction to the financial saving, but zero typically plays a qualitative role in consumer consideration. The non-payment would eliminate the temporary sense of loss that one feels when spending money and would make the decision to spend a lot of money easier since it would not be necessary to defend the financial loss (Stich *et al.*, 2022). This psychological discontinuity is a feasible aspect of market design in digital environments, where marginal distribution costs are minimal, and freemium models are prevalent.

Another way that zero pricing will decrease perceived risk at the acquisition stage is through zero pricing. The financial impact of a failed trial seems minimal, which may result in consumers being ready to download, register or even trial it (Fan *et al.*, 2022). This lessening of hesitation has the ability to increase the consideration set and open consumers to items that they would overlook. Even the term free may be used as a form of attention affecting the evaluation of positive and negative aspects.

But the impact is not the same as that of permanent loyalty (Harimurti Wulandjani *et al.*, 2023). Free offer can cause adoption with no commitment to use, upgrade or intention to pay. Its longer-term effect will depend on the finding of subsequent experience that values it.

Perceived Opportunity Cost

The value of the best alternative that is foregone by choosing an option is called opportunity cost. Opportunity cost is hardly encountered in a properly calculated economic value in consumer decision-making (Torres *et al.*, 2022). This is perceived by comparison, attention and awareness of alternatives. The construct is particularly applicable to digital choice due to the risk that users lose time, privacy, attention, data and the effort of learning and access to better competing services even in cases when no money is exchanged (Bilgin & Lefkeli, 2023).

Perceived opportunity cost must be increased to have more hesitant consideration. A customer who sees that a free application requires too much permissions, shows obtrusive advertising, spends much time, or hides valuable features with subsequent payment will perceive the offer less positively (Prakosa & Sumantika, 2022). The same rationale can be used to paid choices: when one makes a subscription choice, it cannot be used in combination with another service where the expected benefit is higher. Awareness of opportunity-costs is thus a counter to the emotional appeal of zero price. It gets one to focus on what is given up instead of emphasizing only on what is received (Haghpour *et al.*, 2022).

Transaction Utility

Transaction utility deals with how good the deal is perceived to be against an internal reference point (Yang & Wang, 2023). Customers do not judge price based on an absolute value, but comparisons with what they think they would pay or with what they perceive the product ought to cost. When the real conditions come out to be abnormally favourable, the transaction itself gives rise to a psychological satisfaction (Snir *et al.*, 2022). A zero-price bid can thus generate utility on top of the functional value of the digital product since the user will feel that he or she has benefited.

Transaction utility in digital commerce can be affected through discounts, free access time, feature packages, upgrade offers and comparative rates. Non-monetary considerations are also accommodated in the construct (Ashrafimoghari & Suchow, 2022). An offer that is free in money but entails high costs in privacy or attention can have less transaction utility than the price it indicates. On the other hand, a paid offer can provide high transaction utility whereby perceived benefits are significantly higher than the anticipated sacrifice (Gasanov *et al.*, 2022). The utility of transactions therefore converts the market framing and subjective cost judgment to a general feeling of deal value.

Digital Purchase Decision

Digital purchase decision is the readiness to purchase, subscribe to, upgrade or otherwise choose a digital product or service (Fokina & Mottaeva, 2023). The choice goes further than traditional single-time consummation as digital markets tend to have gradual dedication. The consumer can start with free download, advance to regular use, upgrade to paid service, and subsequently refer the service (Hogan *et al.*, 2022). A favourable decision is hence a manifestation of a short-term acquisition as well as the willingness to proceed with or intensify the business relationship.

The perceived value, need fulfilment, risk, comparison with alternatives, and the structure of the offer influence purchase decisions (Fokina & Mottaeva, 2023). Zero pricing may serve to motivate initial usage and transaction utility may make the process of acquisition gratifying. The same decision can be suppressed by making hidden sacrifices salient as the perceived opportunity cost. These processes cannot be used in isolation but should work in tandem with each other as consumers constantly trade off the utility of a deal, against the resources and other options that they have to forego (Maguire *et al.*, 2023).

Integrating Benefit, Sacrifice, and Deal Evaluation

The question that remains a crucial issue that can be addressed by the theory is not on whether free offers are attractive, but how the attraction lasts when consumers take into account the wider costs (Zam *et al.*, 2022). A zero price provides a potent benefit cue. Perceived opportunity cost provides a cue of sacrifices. Transaction utility will incorporate these cues and it will reflect the psychological desirability of the exchange (Haghpour *et al.*, 2022). This structure suggests that there can be both direct and mediated digital purchase decision making.

Where zero pricing promotes the utility of transactions, consumers ought to be more inclined to purchase the corresponding digital item. Purchase willingness should fall when the opportunity-cost awareness decreases the transaction utility (Summers, 2023). Zero price may also persist due to direct effects since at zero price immediate financial barriers may be eliminated independently of deal satisfaction, and opportunity-cost awareness may lead to discouraging acquisition even in the context of consumers still perceiving some transactional value (Haghpour *et al.*, 2022). The approach of treating transaction utility as a mediator thus would not down-play digital choice to just one price-response option, but would present a more wholesome account of how market framing transforms into behavioural intention.

The integrated model also differentiates between the acquisition value, and product value. A consumer can have the idea that a product is convenient yet still refuse the purchase due to the unappealing price, privacy cost, or time cost. The opposite is also possible: exceptionally favourable offer can prompt acquisition even before the consumer has established a robust opinion of the quality of the product in the long term (Maguire *et al.*, 2023).

This is especially critical when considering freemium strategies since the initial purchase may be structured to reduce resistance, but when it comes to the subsequent conversion, evidence of value continues to be needed (Stich *et al.*, 2022). The utility of transactions embodies the instant psychological appraisal of the trade and thus an appropriate theoretically suitable mediator between the attributes of the offers and the willingness to purchase.

The model also appreciates that there can exist the opportunity-cost awareness as well as attraction to free-pricing. Consumers can have a beneficial response to zero price and at the same time perceive privacy, attention, or alternative-use costs (Harimurti Wulandjani *et al.*, 2023). The outcomes of their evaluations hinge on their relative power and influence their final decision. This co-existence view of digital choice provides a much more realistic account of the processes of digital choice than theorizations that presume consumers react to the proclaimed monetary price or merely to functional utility (Maguire *et al.*, 2023).

Conceptual Framework and Hypotheses

The conceptual framework has two exogenous determinants, one mediating construct and one endogenous outcome. Zero-price effect will tend to amplify utility of transactions since the elimination of monetary price will improve the feeling of acquisition of a favourable deal. It can be anticipated that perceived opportunity cost will lessen the utility of transactions since the consciousness of the sacrificed alternatives and non-monetary costs undermines perceived deal quality (Fan *et al.*, 2022). The two antecedents are also anticipated to have direct impacts on digital purchase decision. The purchase decision is then likely to rise via transaction utility, establishing two mediated follow-ups.

H1: The zero-price effect positively impacts considerably the perceived transaction utility among the consumers in digital purchasing settings.

H2: Perceived opportunity cost plays a crucial negative role in the perceived transaction utility of consumers in digital purchasing situations.

H3: The zero-price has a large positive impact on the digital purchase decisions of consumers.

H4: Perceived opportunity cost plays a significant negative role in consumer digital purchase decision.

H5: The utility of transactions has a strong positive influence on digital purchase decisions of consumers.

H6a: The positive relationship between the zero-price effect and the digital purchase decision will be greatly mediated by the transaction utility.

H6b: Transaction utility has a significant mediating effect between the negative relationship perceived opportunity cost and digital purchase decision.

The model thus tests the substantive mechanism that the psychological attractiveness of the transaction is a substantive contributor that influences the digital consumer behaviour by price framing and perceived sacrifice.

MATERIALS AND METHODS

The research design employed in this study was a quantitative and cross-sectional research design to study structural relationships between zero-price effect, perceived opportunity cost, transaction utility and digital purchase decision. The survey design was suitable since the constructs are consumer perceptions, evaluations and behavioural intentions, which are best measured using self-reported answers (Torres *et al.*, 2022). There were 410 valid cases in the analysis dataset. Respondents were those with recent experience in either purchasing, subscribing to, downloading, or using digital products or services, and created the instrument around familiar digital categories, including mobile applications, software, streaming services, online courses, games, cloud storage, e-books, and premium online content.

Screening questions were used to deal with eligibility. They were required to answer questions about whether they had used or obtained a digital product or service in the last 12 months, whether they were 18 years old, and whether they had been to deal with an offer that had been marketed as free, such as a free trial, freemium, zero-cost downloads, or a free subscription period (Bilgin & Lefkeli, 2023). The demographic part was capturing the gender, age group, education and occupation and estimated monthly personal income. Further behavioural questions gauged frequency of purchase, category of digital product most often used, mode of payment most used and previous conversion to the paid version. The analytical sample was characterised using these variables and not as latent constructs in the structural model.

The measurement instrument had six indicators on four reflective constructs resulting into 24 measurement items. The items ZPE1-ZPE6 measured zero-price effect, which included increased attractiveness, positive impression, decreased hesitation, and willingness to try which were related to free digital offers. Perceived opportunity cost was assessed by POC1-POC6 which was a measure of attention to sacrificed alternatives, time, privacy, advertisements, resources and the prospect of forfeiting a more favored paid alternative (Prakosa & Sumantika, 2022). The scale of transaction utility was TU1-TU6 with emphasis on deal satisfaction, comparison, comparison of the reference-price, rewarding discount, and the fitting of feeling the benefits more than the cost experienced. Digital purchase decision was assessed using DPD1-DPD6, which encompasses such ratings as acquisition, subscription, upgrading, recommendation, and choice of the option that perceived the best benefit (Yang & Wang, 2023). Measurement items were done on a five-point Likert scale; 1, strongly disagree, to 5, strongly agree.

The analysis was done using a partial least squares structural equation modelling process (Snir *et al.*, 2022). The descriptive statistics were initially analyzed to determine how the responses were distributed and to ensure that the observed values were not too out-of-scale. Since the model used reflective constructs, the measurement-model evaluation was done before structural paths were

interpreted. Quality of indicators was measured by outer loadings and indicator's reliability. Cronbach alpha was used to measure internal consistency, rho of alpha and composite reliability. Averages variance extracted was used to test convergent validity (Ashrafimoghari & Suchow, 2022). The validity of discriminant was determined using the Fornell-Larcker criterion and the heterotrait-monotrait ratio, which was used to complement each other to show that the four constructs measured empirically distinct concepts.

The evaluation of potential common method bias and collinearity was also considered. The latent constructs were tested on full-collinearity variance inflation factors to diagnose severe common method contamination and inner variance inflation factors evaluated the predictor collinearity in each endogenous equation (Gasanov *et al.*, 2022). The structural assessment then factored in the scale and the direction of direct effects, bootstrap standard errors and confidence intervals, coefficient of determination, predictive relevance and effect sizes. The values of R-squared and adjusted R-squared were employed to explain the variance in transaction utility and digital purchase decision (Ayu, 2023). Predictive relevance was reported with the measures of Q2 predict, root mean square error, and mean absolute error. The size of the f-squared was used to estimate the incremental contribution of each predictor to the corresponding endogenous construct.

Mediation analysis was used to estimate the exact indirect effects of zero-price effect and perceived opportunity cost on digital purchase decision using transaction utility. These two indirect routes were also analyzed independently since they are theoretically different processes; adding value to the deal by zero pricing and subtracting value to the deal by perceived sacrifice. The populated bootstrap coefficients and standard errors in the results of the analysis were used to make structural inference (Van Droogenbroeck & Van Hove, 2022). The test statistics were compared against traditional two-tailed significance levels and a hypothesis was considered to be supported when the estimated effect adopted the direction suggested and the bootstrap evidence was statistically significant. Direct and indirect effects were then viewed jointly with R-squared, Q2 predict and f-squared outcomes such that hypothesis decisions were not viewed in isolation of the model explanatory and predictive performance (Fokina & Mottaeva, 2023). This combined process has offered a consistent platform of reviewing the substantive size, as well as statistical reliability of the suggested relations. The hierarchical order of analysis was deliberate. The quality of measurement was determined prior to any conclusion being made regarding structures since robust path coefficients cannot counteract unreliable or poorly differentiated constructs. Once the reliability of the indicators and construct validity were acceptable, the structural model was tested on collinearity, direct, explained, predictive, and mediated effects (Villalobos Monge *et al.*, 2020). This ranking minimizes chances of

making substantive inferences based on coefficients, which are motivated by measurement shortcomings. It also facilitates explicit comparison of the direct and indirect pathways as outlined in the conceptual framework.

Interpretation concerned both statistically and substantially. The statistical significance was weighed with the effect size and explained variance to ensure that highly negligible but significant effects would not be exaggerated (Hogan *et al.*, 2022). Similarly, predictive relevance was also investigated combined with in-sample R-squared values to establish the presence of useful predictive information in the model and not just by recapitulating the observed associations. Such a joint assessment fits a explanatory-predictive PLS-SEM study whereby the goal

is to comprehend the workings of digital choice and the extent to which the hypothesized constructs elucidate variation in behaviour.

RESULTS AND DISCUSSION

Findings are reported in the order of descriptive assessment, measurement-model evaluation, structural-model assessment and mediation testing (Skwara, 2023). The interpretation of the reported evidence of each table is presented right after the table.

Respondent Profile

The population base reveals a wide range of adult digital-consumers. The percentage of men and women

Table 1: Respondents' Demographic Profile

Variable	Category	Frequency	Percentage
Gender	Female	172	41.95
	Male	227	55.37
	Prefer not to say	11	2.680
Age_Group	18–24	153	37.32
	25–34	148	36.10
	35–44	66	16.10
	45–54	34	8.290
	55+	9	2.200
Education	Bachelor's degree	214	52.20
	Diploma	35	8.540
	Higher secondary or below	37	9.020
	Master's degree	104	25.37
	MPhil/PhD	13	3.170
	Other	7	1.710
Occupation	Freelancer	54	13.17
	Other	7	1.710
	Private-sector employee	115	28.05
	Public-sector employee	49	11.95
	Self-employed/business owner	40	9.760
	Student	129	31.46
	Unemployed	16	3.900
Monthly_Income_BDT	100,000+	35	8.540
	20,000–39,999	96	23.41
	40,000–59,999	83	20.24
	60,000–79,999	47	11.46
	80,000–99,999	27	6.590
	Below 20,000	108	26.34
	Prefer not to say	14	3.410

was 55.37 and 41.95 respectively. The youngest two groups (18-24 and 25-34 years old) constituted 73.42, and it shows effective representation of consumers who may be introduced to the app-based and subscription-based services. Over half were bachelors, with students and workers in the private sector being the two major occupational categories (Jia *et al.*, 2023). The distribution

of income was done in all the reported brackets, which promotes the heterogeneity of purchasing capacity.

Digital Purchasing and Usage Profile

Online shopping was common and not uncommon. Approximately 29.27, two or three times per month and 28.78, about once per month. The most popular types

Table 2: Respondents' Digital Purchasing and Usage Profile

Variable	Category	Frequency	Percentage
Purchase_Frequency	About once a month	118	28.78
	Four or more times a month	60	14.63
	Less than once every six months	39	9.510
	Once every three to six months	73	17.80
	Two or three times a month	120	29.27
Primary_Digital_Product	Cloud storage	32	7.800
	E-book/digital publication	18	4.390
	Mobile application	92	22.44
	Online course	46	11.22
	Online game/in-game content	39	9.510
	Other	5	1.220
	Premium online content	22	5.370
	Software/productivity tool	68	16.59
	Streaming service	88	21.46
Primary_Payment_Method	Debit/credit card	106	25.85
	Digital wallet	55	13.41
	Mobile financial service	165	40.24
	Online banking	36	8.780
	Other	7	1.710
	Platform/app-store balance	41	10
Free_to_Paid_Conversion	No	169	41.22
	Yes	241	58.78

of products were mobile applications and streaming services, then software or productivity tools. The top payment channel was mobile financial services, at 40.24. Notably, 58.78% of them had already upgraded a free version or a trial into a paid service, which is why the free-to-paid decision scenario of the study is quite topical (Zam *et al.*, 2022).

Descriptive Statistics

There is a cluster of item means around the mid-point of the five-point scale showing that the sample did not have extreme agreement but instead both favourable and unfavourable evaluations. The standard deviations were regularly within a 1.14-1.25 range, which indicates sufficient dispersion of responses. Both skew and

Table 3: Descriptive Statistics of Measurement Items

Construct	Item	N	Mean	Standard Deviation	Skewness	Kurtosis	Minimum	Maximum
Zero-Price Effect	ZPE1	410	3.017	1.190	0.033	-0.833	1	5
	ZPE2	410	2.944	1.233	0.067	-0.962	1	5
	ZPE3	410	3.237	1.227	-0.171	-0.934	1	5
	ZPE4	410	3.146	1.242	-0.110	-1	1	5
	ZPE5	410	3.049	1.250	-0.039	-1.009	1	5
	ZPE6	410	3.039	1.221	-0.155	-0.892	1	5
Perceived Opportunity Cost	POC1	410	2.959	1.203	0.021	-0.933	1	5
	POC2	410	2.915	1.231	0.052	-0.952	1	5
	POC3	410	2.946	1.202	0.010	-0.958	1	5
	POC4	410	2.978	1.224	0.098	-0.960	1	5
	POC5	410	2.978	1.181	0.042	-0.871	1	5
	POC6	410	2.837	1.213	0.175	-0.906	1	5
Transaction Utility	TU1	410	3.080	1.193	-0.034	-0.870	1	5
	TU2	410	3.029	1.136	0.003	-0.788	1	5
	TU3	410	3.049	1.159	0.009	-0.822	1	5
	TU4	410	3.049	1.167	-0.002	-0.825	1	5
	TU5	410	3.020	1.233	0.002	-0.991	1	5
	TU6	410	3.044	1.163	-0.085	-0.849	1	5

Digital Purchase Decision	DPD1	410	3.022	1.165	0.041	-0.854	1	5
	DPD2	410	2.971	1.170	0.084	-0.781	1	5
	DPD3	410	2.995	1.164	0.028	-0.891	1	5
	DPD4	410	2.988	1.159	0.099	-0.758	1	5
	DPD5	410	2.995	1.166	0	-0.888	1	5
	DPD6	410	3.032	1.160	0.004	-0.794	1	5

kurtosis values were small and none of the scores were more than 1 or less than 5. The distributions thus have adequate variability to model the proposed relationships.

Common Method Bias

Full-collinearity VIF values were between 1.279 and

2.253. None came anywhere close to standard levels that are linked to extreme collinearity, or a strong common-method effect. The value of transaction utility yielded the greatest value, followed by digital purchase decision, although both were comfortably low (Summers, 2023). The findings thus do not give any report about whether

Table 4: Full-Collinearity Assessment for Common Method Bias

Construct	Full Collinearity VIF	Decision
ZPE	1.685	No serious common method bias
POC	1.279	No serious common method bias
TU	2.253	No serious common method bias
DPD	2.231	No serious common method bias

or not the structural correlations observed are based on an artefact of excessive shared method variance in the self-reported constructs.

Indicator Reliability

Each of the 24 indicators was kept. Outer loadings were between 0.765 and 0.865 with a range of indicator

reliability scores of between 0.585 to 0.749. TU1, POC3, ZPE1 and ZPE6 had the highest loadings, and even the lowest loading indicators were significantly acceptable. The similarity in the pattern implies that every item is its conceived reflective construct with the appropriate strength and that no indicators had to be dropped to achieve the desired level of measurement.

Table 5: Indicator Loadings and Reliability

Construct	Item	Outer Loading	Indicator Reliability	Decision
ZPE	ZPE1	0.860	0.740	Retained
	ZPE2	0.847	0.717	Retained
	ZPE3	0.843	0.710	Retained
	ZPE4	0.813	0.662	Retained
	ZPE5	0.788	0.622	Retained
	ZPE6	0.856	0.732	Retained
POC	POC1	0.843	0.711	Retained
	POC2	0.821	0.675	Retained
	POC3	0.860	0.739	Retained
	POC4	0.809	0.655	Retained
	POC5	0.765	0.585	Retained
	POC6	0.835	0.697	Retained
TU	TU1	0.865	0.749	Retained
	TU2	0.823	0.677	Retained
	TU3	0.803	0.644	Retained
	TU4	0.821	0.674	Retained
	TU5	0.853	0.728	Retained
	TU6	0.825	0.681	Retained
DPD	DPD1	0.846	0.715	Retained
	DPD2	0.836	0.699	Retained
	DPD3	0.783	0.613	Retained
	DPD4	0.786	0.618	Retained
	DPD5	0.816	0.667	Retained
	DPD6	0.837	0.700	Retained

Construct Reliability and Convergent Validity

All constructs had internal consistency and convergent validity. Cronbach's alpha ranged from 0.901 to 0.913, rho_A from 0.902 to 0.914, and composite reliability from 0.924 to 0.932. The range of values of AVE was

between 0.669 to 0.697 indicating that every construct had explained more than half of its indicators. These findings form a consistent and convergent measuring model that can be used in the future to interpret another structure.

Table 6: Construct Reliability and Convergent Validity

Construct	Cronbach Alpha	rho A	Composite Reliability	AVE	Decision
ZPE	0.913	0.914	0.932	0.697	Reliability and convergent validity established
POC	0.904	0.911	0.926	0.677	Reliability and convergent validity established
TU	0.911	0.913	0.931	0.692	Reliability and convergent validity established
DPD	0.901	0.902	0.924	0.669	Reliability and convergent validity established

Fornell-Larcker Discriminant Validity

Fornell-Larcker matrix is in favor of discriminant validation. In both constructs, the square root of AVE on the diagonal was greater than the amount of absolute value of its correlation with the other constructs (Bourgeois, 2020). The most substantive correlation

between transaction utility and digital purchase decision proved to be the strongest, which is likely, but their values of diagonal validity were even greater than the inter-construct correlation was. The four constructs may thus be regarded as being empirically different.

Table 7: Fornell-Larcker Criterion

Construct	ZPE	POC	TU	DPD
ZPE	0.835	-0.117	0.585	0.550
POC	-0.117	0.823	-0.368	-0.416
TU	0.585	-0.368	0.832	0.694
DPD	0.550	-0.416	0.694	0.818

HTMT Discriminant Validity

The conclusion on discriminant-validity is supported by the findings of HTMT. The biggest ratio was 0.765 between transaction utility and digital purchase decision then 0.640 between zero-price effect and transaction utility. Each and every ratio was lower than the conservative cut-

off values that are mostly applied to define problematic overlap of constructs. The fact that the ZPE-POC ratio is by far too small as well suggests that attraction to zero pricing cannot be merely the reverse of awareness of opportunity-costs, however; the model reflects distinct psychological operations (Lowens, 2023).

Table 8: Heterotrait-Monotrait Ratio of Correlations

Construct	ZPE	POC	TU
ZPE			
POC	0.125		
TU	0.640	0.400	
DPD	0.605	0.457	0.765

Inner Collinearity Assessment

Inner VIF values ranged from 1.014 to 1.763. Endogenous equations thus had a minimum amount of collinearity. The predictors of the utility of the transaction price, perceived opportunity cost (almost orthogonal to zero-price effect), and predictors of the digital purchase decision were very

low (near critical levels). The interpretation of structural coefficients can then be done, without worrying that severely overlap predictors are inflating the standard errors or destabilising the estimated effect.

This chapter deals with the problem of direct effects and hypothesis testing.

Table 9: Inner Variance Inflation Factor Results

Endogenous Construct	Predictor Construct	Inner VIF	Decision
TU	ZPE	1.014	No critical collinearity
	POC	1.014	No critical collinearity
DPD	ZPE	1.545	No critical collinearity
	POC	1.177	No critical collinearity
	TU	1.763	No critical collinearity

Direct Effects and Hypothesis Testing

The bootstrapped direct effects show support to all the five directional hypotheses. Zero-price effect was found to positively predict transaction utility, as well as, digital purchase decision, but perceived opportunity cost had a negative result on both measures. Digital purchase decision also was also positively influenced to a significant

extent by transaction utility (Purohit *et al.*, 2023). The biggest was the zero-price effect to the transaction utility, and then the transaction utility to digital purchase decision. In all the cases the estimated coefficient was in the hypothesised direction and the t-ratio was significantly higher than the traditional significance levels.

Table 10: Direct-Effect Hypothesis Testing

Hypothesis	Relationship	Beta	SE	t	p	Decision
H1	ZPE -> TU	0.5497	0.0313	17.56	<0.001	Supported
H2	POC -> TU	-0.3046	0.0350	8.70	<0.001	Supported
H3	ZPE -> DPD	0.2515	0.0400	6.29	<0.001	Supported
H4	POC -> DPD	-0.2132	0.0358	5.96	<0.001	Supported
H5	TU -> DPD	0.4690	0.0423	11.09	<0.001	Supported

Explanatory Power and Predictive Relevance

The model identified 43.29% and 55.18% parts of variance in transaction utility and digital purchase decision, respectively. There was a very slight difference between adjusted R-squared and that showed that there was not much inflation due to over-fitting. Both endogenous

constructs were also found to have predictive relevance with Q2 predict values of 0.4272 in the case of transaction utility and 0.5450 in the case of digital purchase decision (Mileros, 2020). The results show there is significant explanatory and predictive power as opposed to statistical significance without realistic model performance.

Table 11: Coefficient of Determination and Predictive Relevance

Endogenous Construct	Construct Code	R Squared	Adjusted R Squared	Q2 Predict	RMSE	MAE	Explanatory Power	Predictive Relevance
Transaction Utility	TU	0.433	0.430	0.427	0.758	0.620	Weak to moderate	Predictive relevance established
Digital Purchase Decision	DPD	0.552	0.548	0.545	0.675	0.541	Moderate	Predictive relevance established

Effect Sizes

Effect sizes explain the relative level of importance of the predictors. Zero-price had a significant incremental impact on transaction utility and perceived opportunity cost did medium. Direct effects of zero-price effect and perceived opportunity cost were very small in case of

digital purchase decision, but transaction utility had a medium effect. This trend is in line with the put forward mediation logic since a portion of the impact of the two antecedents is passed on via the evaluation of transaction value by the consumers.

Table 12: Effect Size Results

Predictor	Endogenous Construct	f Squared	Effect Size
ZPE	TU	0.524	Large
POC	TU	0.161	Medium
ZPE	DPD	0.091	Small
POC	DPD	0.087	Small
TU	DPD	0.278	Medium

Mediation Analysis

Both the specific indirect effects were significant and of the hypothesised direction. The positive pathway through the utility of transaction and the negative pathway through the perceived-opportunity-cost were the zero-price and the opportunity-cost paths, respectively. The standard errors of the bootstrap approximations were

also small compared to the indirect ones that resulted in large t- ratios and significance that were below the traditional 0.001. The findings thus confirm H6a and H6b and establish transaction utility as an explanatory factor that supports the use of both price attraction and perceived sacrifice to make digital purchases (Wellbrock & Buschow, 2020).

Table 13: Specific Indirect Effects and Mediation Results

Hypothesis	Indirect relationship	Indirect effect	SE	t	p	Decision
H6a	ZPE -> TU -> DPD	0.2578	0.0275	9.37	<0.001	Supported
H6b	POC -> TU -> DPD	-0.1429	0.0213	6.71	<0.001	Supported

Effect Decomposition

Effects decomposition reveals that zero-price effect has an impact on digital purchase decision by a direct pathway, as well as an extra positive indirect pathway via transaction utility. Perceived opportunity cost equally presents a negative direct impact and indirect impact as

well. The overall effects resulting are larger in absolute terms than the direct effects correspondingly. The utility of transactions thus does not merely go along with the two antecedents; it conveys to some degree the influence of their behaviour.

Table 14: Direct, Indirect and Total Effects

Predictor	Outcome	Direct effect	Indirect effect	Total effect
ZPE	TU	0.5497	0.0000	0.5497
POC	TU	-0.3046	0.0000	-0.3046
ZPE	DPD	0.2515	0.2578	0.5093
POC	DPD	-0.2132	-0.1429	-0.3561
TU	DPD	0.4690	0.0000	0.4690

Hypothesis Summary

The hypothesis summary attests to a structuring pattern. All other five direct hypotheses and two mediation hypotheses are accepted when bootstrap estimates populated, standard errors and all the significance evidence are inferred. Zero-price effect is some type

of attracting mechanism, perceived opportunity cost is some type of restraint mechanism, and transaction utility transforms such considerations into willingness to purchase (Haghpour *et al.*, 2022). The last model hence informs the suggested price framing, perceived sacrifice, deal value and digital consumer choice integration.

Table 15: Summary of Hypothesis Testing

Hypothesis	Relationship	Beta	t	p	Decision
H1	ZPE -> TU	0.5497	17.56	<0.001	Supported
H2	POC -> TU	-0.3046	8.70	<0.001	Supported
H3	ZPE -> DPD	0.2515	6.29	<0.001	Supported
H4	POC -> DPD	-0.2132	5.96	<0.001	Supported
H5	TU -> DPD	0.4690	11.09	<0.001	Supported
H6a	ZPE -> TU -> DPD	0.2578	9.37	<0.001	Supported
H6b	POC -> TU -> DPD	-0.1429	6.71	<0.001	Supported

Discussion

The results indicate that free in digital markets economics is not entirely monetary or entirely emotional. Zero-price effect has a powerful positive impact on the utility of transactions, and it shows that it is possible to think that free access is more than a saving point to the consumer. By eliminating the monetary price, there is no longer a perceived price of the transaction and allows a sense of greater benefit to be felt (Maguire *et al.*, 2023). This finding can be used to understand why free trials, freemiums, and free downloads can be used to gain users even in the categories where the paid alternative is affordable. The high value of the effect size of zero-price effect on transaction utility suggests that the psychological reaction of free price is the focus of consumer attitude towards the judgment of the deal itself.

Perceived opportunity cost goes in the opposite way. Attentive consumers to sacrificed alternatives, time, privacy, advertisement or resource demand are found to be less utility bearing in terms of transactions and less willing to make purchases. This result is significant as it determines the limit of the free-price attraction. Zero money price does not sacrifice; it can just transform its appearance (Stich *et al.*, 2022). The seeming benefit of the offer is undermined when non-monetary costs come into

the limelight. Digital companies do not have a license to think that a free-point of entry will be effective to offset intrusive advertising, bad privacy habits, high learning, or limited functionality.

Digital purchase decision is also significantly directly affected by transaction utility, and mediates the relationships between antecedents. The results of the mediation indicate that the consumers partially mirror price framing and opportunity-cost awareness into action by a judgment of whether the transaction is favourable (Choi & Jeon, 2023). This process is particularly applicable to the digital consumption in a staged format. It is common that users start with a free version and then make an evaluation of value and move on to subscribing or upgrading (Sun, 2023). The percentage of 58.78 of the respondents that have turned free to paid offering is also a distinguishing factor that trial and purchase are not two different behaviours.

The model has a good level of explanatory power on a behaviour study. The predictors explain 43.29% of transaction utility and 55.18% of digital purchase decision and both endogenous constructs have been found to explain predictively. These results, along with adequate reliability, discriminant validity, and low collinearity, indicate that the integrated model represents a significant

percentage of digital choice (Fenneman *et al.*, 2022). It is the best hint, however, that free does not always work, but that it will work best when the transaction value created by the consumer in terms of visible benefits and monetary and non-monetary sacrifice are evaluated.

This is sharpened by the relative effect sizes. Zero-price effect adds significant value to the transaction utility but it has a smaller value in making the purchase decision (Deng *et al.*, 2023). The same can be said of perceived opportunity cost, although it has medium impact on transaction utility, but has a small direct impact on purchase decision. These variations suggest that assessment of the deal is not some accidental result of pricing; it is a significant pathway to make pricing and sacrifice behavioural intention (Fan *et al.*, 2022). Companies, which only concentrate on the acquisition price, might thus misinterpret consumer reaction in case they also fail to control the quality of the perceived transaction.

The use of the findings can also be used to explain why it is possible to have free-to-paid conversion. Free access can create some favourable first transaction, further readiness to pay comes with continued perception of benefits exceeding costs arising. The utility of the transactions can thus change throughout the customer journey (Torres *et al.*, 2022). A compelling zero-price offering can serve to establish adoption and a well-thought-out upgrade will ensure the feeling of receiving a superior value as opposed to what can be seen as the elimination of an already enjoyed privilege.

Theoretical and Practical Implications

The paper builds upon digital consumer theory by connecting the psychology of zero-prices and opportunity-cost rationale by use of transaction utility. It demonstrates that attraction and sacrifice are separate antecedents and not on the opposite side of a single continuum (Tiemessen *et al.*, 2023). Transaction utility is the assessive mediator between these antecedents and behavioural intention and helps us adopt a process perspective of digital purchase decision making where the perceived deal value is determined by the offer framing prior to being turned into an acquisition or upgrading behaviour.

To managers, the outcomes are more favourable to free-entry strategies which actually generate true value as opposed to just having a price cut. Critical value features must be instantly apparent with free trials and freemium prices, avoidable privacy or attention pricing must be kept to a minimum, and there should be a believable way to transition to paid (Bilgin & Lefkeli, 2023). Companies should also consider any hidden costs like advertising intensity, onboarding energy, data needs and feature constraints since they can destroy the utility of transactions generated by free access.

Limitations and Future Research

The research is cross-sectional and the dependence on the self-reported perceptions, thus the causal ordering needs

to be viewed in the theoretical framework presented in the research in relation to the self-reported data instead of viewing it as experimental evidence. There is also a mixture of several types of digital products in the sample, which enhances breadth, but could also mask category-specific responses (Prakosa & Sumantika, 2022). The use of longitudinal conversion data, experiments that control zero and zero-low pricing, or a multi-group comparison between subscription, gaming, software, education, and streaming could be used in future research.

CONCLUSION

This paper has shown that the digital buying choices are influenced by both the appeal and the drawback of zero prices as well as the inhibition by the perceived opportunity cost. Zero-price effect enhances the utility of the transaction and purchase willingness and opportunity-cost awareness reduces both. Transaction utility has a direct empowerment of the digital purchase decision, as well as is heavily charged with the impact of both antecedents. The model offers an integrated explanation of why free offers can be effective yet non-persuasive across the board, with the properties of good measurement, an explanatory variance that is meaningful, and a well-established predictive relevance. The question of whether the price is zero or not, in the digital markets does not hold the day but rather whether the whole transaction is perceived to be a better one by the consumers after evaluating what they will reap and what they will lose.

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