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Promotion-rule Complexity and Checkout Abandonment in E-commerce Sales Events: The Mediating Role of Consumer Confusion

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Abstract. With the rise of big e-commerce sales events, multiple layers of promotions exist, such as platform coupons, store coupons, stacking, membership discounts and category discounts, which make the checkout process more complex. Promotional mechanisms can help to make the product more attractive, but can also diminish price transparency and add to cognitive load. This research examines the relationship between promotion-rule complexity and consumer checkout abandonment tendency and the role of consumer confusion in this relationship. A mixed-method approach was adopted to analyze a publicly available dataset of 12,330 online shopping sessions, and a survey based on a set of scenarios with 218 valid responses. The findings show that the complexity of the promotion rule has a significant effect on consumer confusion, which consequently results in a higher checkout abandonment tendency. Promotion-rule complexity is positively related to checkout abandonment through consumer confusion. The results contribute to the promotion literature by focusing on the last mile of the promotion process and have implications for e-commerce platforms that aim to minimise the friction involved in decisions by creating simpler rules and more transparent pricing.

Keywords: E-commerce, Promotion Complexity, Consumer Confusion, Checkout Abandonment

1. Introduction

In the world of online sales, large-scale e-commerce sales events have transformed price reductions from simple discounts into multi-layered decision processes. Platform coupons, store coupons, memberships, threshold discounts and stacking restrictions are ways the final payable figure can be reduced. These mechanisms can help to make promotions more appealing, but at the same time make it less transparent what the final price will be and make it harder to verify.

Recently, some sophisticated promotions were found to cause confusion among consumers and resulting negative responses in order to increase perceived value [1]. Evidence of such impact of price promotion on consumer behavior has also been reported at the large scale retail platform for even small price cuts [2]. The theory underpinning research on consumer decision-making is that too

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much or too complex information overloads the decision maker, and that constructive-choice theory suggests that decision-making strategies are influenced by task demands and limited capacity [3].

But the majority of previous studies on promotion research have been based on the magnitude of discount, the intention to buy or the number of items that were not added to the shopping cart at the point-of-sale. The mere act of reaching the checkout stage doesn't mean that the payment process is finished, as consumers who have started the checkout process can still drop out [4]. This study thus investigates the influence of the size and complexity of the promotion rules on checkout abandonment tendency and whether consumer confusion is a possible determinant of this effect. By using a mixed method approach—a secondary analysis of a publicly available e-commerce data set and a scenario-based survey experiment, this study examines how complex promotional structures can hinder the completion of the transaction.

2. Literature review & hypothesis development

2.1. Online promotion-rule complexity

In online sales events, the sales organization's promotion-rule complexity can be defined based on the number of rules. The promotion rule complexity is the cognitive and procedural complexity that is imposed by the structure of a promotional offer, rather than the discount magnitude. Multiple promotional tools, spending limit requirements, qualification criteria, stacking limits, and multi-step processes to determine amount payable are some of the factors that complicate online sales events. The more difficult the comparison and calculation experience, the more unfavorable the choice experience becomes, if two promotion structures are available and they provide the same savings [2]. Information-load research shows that the quality of decision and the confidence in the decision decrease when the consumer is overwhelmed with information [3]. According to constructive-choice theory, consumers use a simplified decision strategy when demand for the task is high [5]. The perceived cost of purchase is thus increased by the complexity of the promotion rule.

2.2. Consumer confusion

Consumer confusion is a situation where consumers are unable to comprehend, compare and evaluate the information in the market. Walsh, Hennig-Thurau and Mitchell suggested dimensions of confusion proneness (similarity, overload and ambiguity), and showed that confusion has a negative impact on behaviour [6]. Garaus concluded that online retail processes do not always provide a convenient experience for consumers and that confusion among online shoppers is a unique phenomenon, with specific causes and effects [7]. The complicated promotional rule set is a feature of the decision environment, the output of which is consumer confusion.

2.3. Checkout abandonment tendency

Shopping-cart abandonment and checkout abandonment are two different things. Shopping cart abandonment happens at any point in time after adding items to the cart, while checkout abandonment is when the user is at the last step of completing the checkout process without making a payment [4]. Rajamma, Paswan and Hossain identified that perceived transaction inconvenience is a reason for shopping cart abandonment [8]. Kukar-Kinney and Close showed that a number of situational and behavioural factors impact cart abandonment [9]. In the current study, checkout

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abandonment tendency is the probability of leaving the checkout page, postponing the payment, returning to the cart or canceling the order after starting checkout.

2.4. The conceptual framework and hypotheses for this study are included

There are three gaps that underlie the proposed model. First, research on promotion has mainly focused on the promotion effects or the intensity of the discount, and has less concerned on the structure complexity. Second, there are a lot of studies measuring purchase intent, but checkout abandonment is much closer to the point of conversion. Third, the underlying reason for late-stage discontinuation from multiple promotion rules is not known. The conceptual framework indicates that there are two pathways: promotion-rule complexity to checkout abandonment tendency, and promotion-rule complexity to consumer confusion to checkout abandonment tendency. Thus, we propose:

H1: Promotion-rule complexity positively affects consumers' checkout abandonment tendency

H2: Positive effect of promotion-rule complexity on consumer confusion.

H3: The tendency to abandon checkout is positively influenced by consumer confusion.

H4: The positive effect of promotion-rule complexity on checkout abandonment tendency is mediated by consumer confusion.

3. Research methodology

3.1. Mixed-method research design

This study adopts a mixed method approach, which includes secondary analysis of a publicly available e-commerce data set and a survey experiment with scenarios. The secondary data gives large-scale evidence of the connection between the load of information processing and completing the purchase, and the survey experiment enables to directly manipulate the complexity of the promotion rules and measures the consumer confusion as a psychological mediator.

3.2. Secondary analysis of public e-commerce dataset: study 1

3.2.1. Data source and variables

Study 1 uses the dataset: Online Shoppers Purchasing Intention Dataset [10], which is publicly available from the UCI Machine Learning Repository. The data consists of 12, 330 customer sessions with behavioral variables and the purchase decision made at the end of the session.

It is acknowledged that this data does not directly measure promotional rule structures, but it is a legitimate concern whether it really reflects "promotion-rule complexity". It is argued, however, that the behavior of browsing product-related pages can be considered a valid behavioral proxy for promotion information processing load for the following reasons: (1) during large-scale e-commerce sales events, promotion information (coupon eligibility, stacking rules, threshold conditions) is included within product pages; (2) more complicated promotion rules require consumers to browse more pages to compare options, verify eligibility, and to calculate optimal combinations; and (3) information-load theory suggests that the number of pages browsed are a direct function of the complexity of the decision environment [3]. Therefore, Study 1 does not directly manipulate promotion complexity, but offers complementary behavioral evidence of how information processing load varies systematically with promotion complexity and how this load is related to confusion-related behavioral indicators and abandonment.

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Information Processing Load (X): ProductRelated (no of product-related pages viewed). The larger the number, the more exposure to product and promotion information.

Behavioral Confusion Indicator (M): BounceRate. A high bounce rate may indicate withdrawal behavior consistent with confusion [7].

Y = Checkout Abandonment (Revenue whether the session resulted in a purchase). Sessions without purchase are considered Abandonment.

3.2.2. Analytical approach

Independent-samples t-tests are used to compare variables for the purchase-completed and abandonment groups. PROCESS Model 4 with 5, 000 bootstrap resamples is used to test the mediation effect of bounce rate on the link between page views related to products and purchase completion [11].

3.3. Scenario-based survey experiment: study 2

3.3.1. Research design

A randomized scenario-based online experiment was carried out with the participants allocated to two experimental conditions. In the simple condition, the members read: "An order of RMB 300 will automatically be reduced by RMB 40". In the complex condition, the saving of RMB 40 is distributed among four coupons (a platform coupon for RMB 40 off RMB 200, a store coupon for RMB 10 off RMB 100, a membership coupon for RMB 5 off no threshold, and a category coupon for RMB 5 off RMB 50). Product price, product description, reviews (4.8 stars) and delivery conditions were all the same in both scenarios.

3.3.2. Sample and measures

A total of 254 responded of which 218 (85.8% retention; 109 per condition) were valid after QC. The sample comprised 52.8% female, mean age 28.9 years (SD = 7.6).

The complexity of the promotion-rule, an experimental variable, was manipulated. The manipulation-check items referred to perceived complexity ($\alpha = 0.90$). Consumer confusion was assessed with five items that were adapted from Walsh et al. and Garaus ($\alpha = 0.91$). Five items adapted from Kukar-Kinney and Close and Rajamma et al. were used to measure checkout abandonment tendency ($\alpha = 0.89$) [6-9]. The scales used for all items were 7-point Likert scales.

3.3.3. Analytical approach

SPSS 27.0 and PROCESS macro version 4.2 were used for data analysis [11]. Independent-samples t-tests were used to compare outcomes between conditions. Bootstrap resampling (5, 000 resamples) was used to test mediation using PROCESS Model 4.

4. Results

4.1. Study 1: secondary dataset analysis

The dataset contained 12, 330 sessions (10, 422 no-purchase, 84.5%; 1, 908 purchase-completed, 15.5%). Table 1 presents the comparison of product-related page views and bounce rate between the

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no-purchase and purchase-completed groups.

Table 1. A comparison of variables by Purchase Completion (Study 1)

Variable	No Purchase (n=10,422)	Purchase Completed (n=1,908)	t	p	Cohen's d
ProductRelated (pages)	28.97 (50.12)	42.54 (67.93)	9.87	< 0.001	0.26
BounceRate	0.024 (0.051)	0.011 (0.034)	12.56	< 0.001	0.33

Note: Values are shown as M (SD).

Purchase-completed sessions had significantly more product related page views (t = 9.87, p < 0.001) and significantly fewer bounce rates (t = 12.56, p < 0.001). A mediation analysis (PROCESS Model 4) showed that the association between ProductRelated and Revenue was significantly mediated by BounceRate (indirect effect = -0.00019, BootSE = 0.00003, 95% CI [-0.00025, -0.00014]). This was generally the case, although greater page views were associated with higher purchase probability, bounce rate represented a withdrawal pathway that negatively predicted conversion.

4.2. Survey experiment results

4.2.1. Manipulation check

Participants in the complex-rule condition perceived the rules as significantly more complex (M = 5.58, SD = 1.31) than those in the simple condition (M = 2.76, SD = 1.38), t(216) = 15.74, p < 0.001, Cohen's d = 2.14.

4.2.2. Descriptive statistics and correlations

Table 2 presents the means, standard deviations, and correlations among condition, consumer confusion, and checkout abandonment tendency in Study 2.

Table 2: Means, standard deviations, and correlations (Study 2)

Variable	M	SD	1	2	3
1. Condition (0=simple, 1=complex)	—	—	—		
2. Consumer Confusion	4.18	1.71	0.39***	—	
3. Checkout Abandonment Tendency	3.85	1.60	0.32***	0.52***	—

**Note: n = 218. **p < 0.001.*

4.2.3. Hypothesis testing

H1 was supported: complex-rule participants reported significantly higher checkout abandonment (M = 4.28, SD = 1.54) than simple-rule participants (M = 3.42, SD = 1.58), t(216) = 4.13, p < 0.001, Cohen's d = 0.56.

H2 was supported: complex-rule participants reported significantly higher consumer confusion (M = 4.91, SD = 1.45) than simple-rule participants (M = 3.45, SD = 1.67), t(216) = 6.98, p < 0.001, Cohen's d = 0.95.

H3 was supported: consumer confusion was a significant predictor of checkout abandonment. Hierarchical regression, controlling for condition and demographics, revealed a significant relation

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between consumer confusion and checkout abandonment (β = 0.45, p < 0.001, $\Delta R^2 = 0.18$).

Table 3 presents the mediation analysis results for Study 2, including the paths from condition to consumer confusion, from consumer confusion to checkout abandonment tendency, and the total and direct effects of condition on checkout abandonment tendency.

Table 3: Mediation result of Study 2

Path	Coefficient	SE	t	p	95% CI
Condition → Confusion (a)	1.46	0.21	6.95	< 0.001	[1.05, 1.87]
Confusion → Abandonment (b)	0.44	0.06	7.33	< 0.001	[0.32, 0.56]
Condition → Abandonment (c, total)	0.86	0.21	4.10	< 0.001	[0.45, 1.27]
Condition → Abandonment (c', direct)	0.48	0.20	2.40	0.017	[0.09, 0.87]

H4 was supported: the indirect effect of condition on checkout abandonment tendency through consumer confusion was significant (indirect effect = 0.64, BootSE = 0.11, 95% CI [0.42, 0.87]). Because the bootstrap confidence interval did not include zero, the mediating effect of consumer confusion was confirmed. The direct effect of condition on checkout abandonment tendency remained significant after including consumer confusion, indicating partial mediation. Therefore, promotion-rule complexity positively affected checkout abandonment tendency through consumer confusion, and H4 was supported.

5. Discussion

Both studies support all four hypotheses, and the results from both studies are consistent. Study 1 showed that there is a positive relation between information processing load and purchase completion, but with the confounding effect of confusion-related withdrawal behavior (bounce rate) on this relation. Study 2 demonstrated that promotion-rule complexity has a significant impact on consumers' level of confusion and tendency to abandon shopping, and that this effect is largely due to a higher level of confusion.

The study results show that the economic value of a promotion alone is not enough to convert. If a cognitive effort must be increased to obtain the same monetary discount, consumers will be more inclined to abandon checkout. This is in line with information-overload and constructive-choice perspectives [3, 6], and evidence that promotion complexity leads to increased consumer confusion [1]. The positive confusion-to-abandonment pathway is in line with results from online retail research that indicates that confusing processes and transaction inconvenience at the end of a process lead to negative behavior [7, 8].

Results show a double-edged effect of promotion design. Layered promotions with multiple benefits can be more attractive while they can also be more difficult to confirm. The current framework builds upon the longstanding literature on shopping cart abandonment, which has included consumer and website factors and adds the mechanisms of consumer confusion [4].

The following limitations should be noted. While Study 1 cannot directly measure the complexity of a promotion rule, it uses behavioral proxies which are addressed in the experimental validation in Study 2. Scenario based intentions might not completely replace the actual behavior of platforms. The relationships between these variables should be investigated in the future based on platform clickstream data and using direct measures of promotion complexity, and individual differences should be investigated as moderators.

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6. Conclusion

This study proposes and examines a model of promotion-rule complexity for consumers at e-commerce sales events during their checkout process. The results, using a mixed method (secondary analysis of the publicly available dataset, N = 12, 330, and the survey experiment, N = 218), indicate that mental effort to understand complex promotional rules leads to increased consumer confusion, and this in turn leads to an increased tendency to abandon the checkout. Much of this impact is due to consumer confusion.

The study not only incorporates an additional conversion step to the promotion research process but also sheds light on the potential for attractive discounts to fail in driving purchases, given multiple thresholds and stacking restrictions. The results indicate implications for platform managers: decrease the number of rules, implement automatic discounts, and make the final payable amount prominent.

Future studies should investigate these relationships with platform clickstream data that directly measures promotion complexity, and investigate whether there are individual differences between participants in terms of digital literacy, promotion familiarity and price sensitivity that are moderators.

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