Exploration of Factors Influencing Consumers' Online Purchase Intentions During Crises in Sri Lanka

Group Name: Group 13
Date: May 13, 2025

Team Members:
Rathnayake R.M.I.B. - 220526N
Samarakoon E.S.P.A - 220548H
Ranasinghe P.I. - 220503R
Dissanayake C.N. - 220133G
Jayathunga R.D.S.S. - 220277B

1. Problem Overview

Amid ongoing crises in Sri Lanka, traditional shopping patterns have shifted dramatically, leading to a rise in e-commerce. As a leading operator of supermarkets and shopping malls, Wolt seeks to understand these evolving consumer behaviors. This study explores key factors affecting online purchasing intentions during crisis periods, helping Wolt adapt its marketing strategies and enhance digital services.

We conducted a comprehensive survey to capture public perceptions about online shopping during crisis periods and received 836 valid responses. The survey included questions targeting key influencing factors such as Perceived Ease of Use, Perceived Usefulness, Structural Assurance, and Social Influence. It also covered mediating variables like Attitude and Perceived Risk, along with moderating variables like age and gender. Using this data, we performed an in-depth analysis to uncover the main drivers and barriers to online purchasing behavior during crises.

2. Data Pre-processing Steps

2.1 Data Loading and Initial Inspection

We began our analysis by loading the survey dataset containing 836 responses using Python's Pandas library. Initial inspection revealed 59 columns corresponding to the different sections of the survey questionnaire. The dataset included demographic information, familiarity with online platforms, and responses to questions measuring various factors.

2.2 Data Cleaning

We used NumPy library for data cleaning tasks and transforming data types for analysis. Several data quality issues were identified and addressed:

1. **Duplicate Entries**: 11 duplicate responses were identified and were removed from the dataset.
2. **Inconsistent Data**: We noticed inconsistencies in platform names where multiple platforms were stored as comma-separated values. For example, "*AliExpress"* appeared in different forms like "ali express", "ali express", and "ali express.com". To standardize these variations, we used the fuzzywuzzy library to calculate fuzzy string similarity scores. Based on a defined threshold, we grouped similar entries together and converted them into a consistent format specifically, all lowercase and without spaces (e.g., aliexpress).
3. **Missing Values**: We observed missing values in the platform-related columns: platform_general (15), platform_auto (222), platform_pharmacy (276), platform_fashion (208), and platform_grocery (54). Since we couldn't confidently predict which platform the respondent used, and to avoid introducing bias by imputing with the mode, we assigned the value 'unknown' to these missing entries.
4. **Outlier Detection**: Since all columns in the dataset are categorical, there were no outliers.

2.3 Scale Reliability and Validity Assessment

To ensure the reliability and validity of our measurement scales, we conducted the following analyses:

Cronbach's Alpha: We calculated for each construct to assess internal consistency reliability.

- Perceived Ease of Use (PEOU): $\alpha = 0.894$
- Perceived Usefulness (PU): $\alpha = 0.898$
- Structural Assurance (SA): $\alpha = 0.898$
- Social Influence (SI): $\alpha = 0.910$
- Attitude: $\alpha = 0.514$
- Perceived Risk: $\alpha = 0.463$
- Intention to Purchase Online: $\alpha = 0.626$

As shown, the primary constructs (PEOU, PU, SA, and SI) demonstrate excellent internal consistency, with Cronbach's alpha values above 0.89, confirming their strong reliability as measurement instruments. In contrast, Attitude and Perceived Risk recorded alpha values below 0.6, suggesting poor internal consistency.

Inter-item Correlation: Inter-item correlation matrices were examined to ensure that items within each construct correlated well without redundancy. PEOU, PU, SA, and SI showed strong internal consistency with high inter-item correlations. Attitude and Perceived Risk had low reliability and weak inter-item alignment. One item under Intention to Purchase had very low correlation with others and may need to be removed.

2.4 Data Transformation

The following transformations were applied to prepare the data for analysis:

1. **Variable Aggregation**: For each sub-factor (e.g., Ease of Navigation, Learn Curve), we calculated mean scores of the corresponding questions to create composite variables.
2. **Categorical Variable Encoding**: For question-type columns with ordinal responses (e.g., Likert scale), we used ordinal encoding to preserve the order. For nominal columns:
    - With 2 categories (e.g., gender, marital status), we applied one-hot encoding.
    - With more than 2 categories (e.g., education, profession), we used label encoding.

For platform columns containing multiple comma-separated values, we applied multi-hot encoding, creating a binary column for each unique platform.

3. Insights from Data Analysis

3.1 Descriptive Analysis

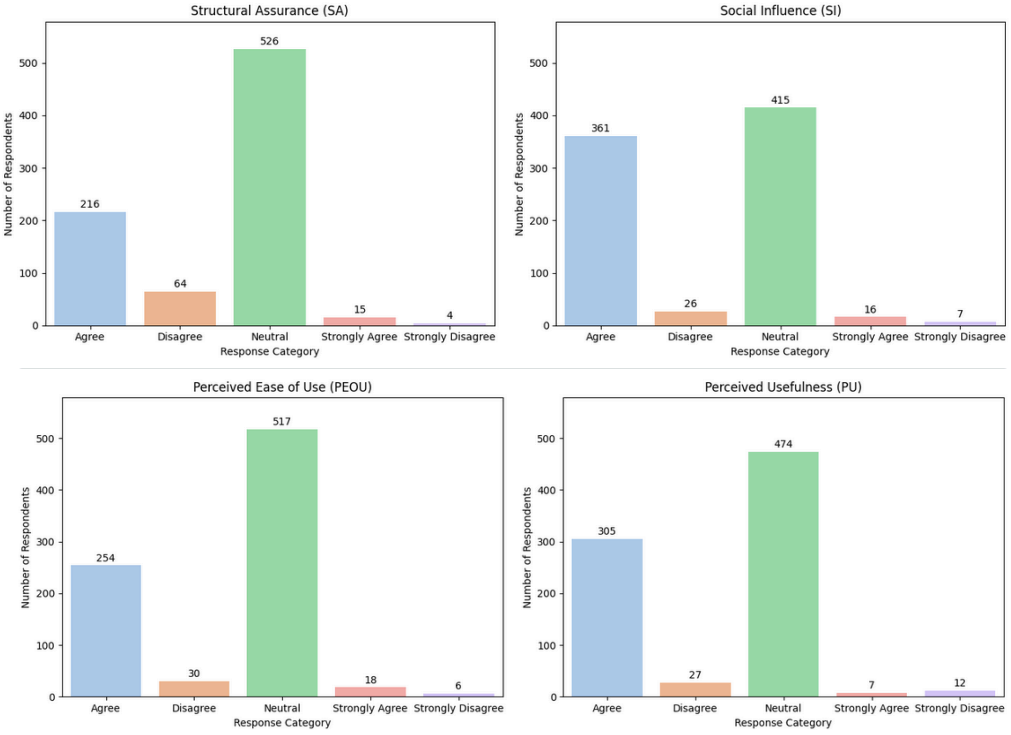
Our sample of 836 respondents presents a diverse cross-section of Sri Lankan consumers. The majority (77%) of respondents fall into the ages 25-35, followed by 17% in the first category, likely 18-25. Only 6% belong to the third group ,and less than 1% are in the oldest bracket, likely 45-55.

A large majority of respondents (69.6%) fall into category Bachelor's Degree, followed by 11.5% in category Master's Degree or higher and 9.3% in category Diploma / Certificate Course. Smaller proportions are seen in category High school (8.5%), while categories School and Postgraduate Diploma represent a minimal share of the sample (less than 1% each).

The majority of respondents (99.6%) indicated that they have previously used online platforms for purchasing, demonstrating high familiarity with e-commerce. Additionally, the sample is male-dominated, with 67% identifying as male and 33% as female.Out of 825 respondents, 798 made online purchases during crisis times, while only 27 did not.
Across all four factors - Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Structural Assurance (SA), and Social Influence (SI) - the most frequent response category was Neutral, indicating that many respondents held

moderate or undecided opinions.

- For PEOU, 517 respondents (62.3%) remained neutral, followed by 254 (30.6%) agreeing. Only 18 (2.2%) strongly agreed.
- In PU, 474 (57.3%) were neutral and 305 (36.9%) agreed, while only 7 (0.8%) strongly agreed.
- Regarding SA, 526 respondents (63.3%) were neutral, 216 (26%) agreed, and just 15 (1.8%) strongly agreed.
- For SI, 415 (51.3%) were neutral, and 361 (44.6%) agreed, showing relatively stronger agreement compared to the other variables.



Of the overall online shopping websites, Daraz is well ahead with 745 users (36.2%), followed by Kapruka (27.3%) and Ikman (25.2%). In the automobile category, Riyasewana is dominant with 342 users (28.4%), followed by Autolanka and Unknown websites with nearly 20% each.

For pharmacy websites, the most utilized are Unknown (26.5%), Online pharmacy (22.1%), and Healthguard (16.6%). For the fashion segment, Kapruka again is the most utilized with 444 users (30.2%), followed by Unknown (14.5%) and Odel (11.3%).For grocery ordering, UberEats (32.7%) was used most, followed by PickMeFoods (28.7%) and Keels (27.2%), showing a clear preference for app-based grocery ordering.

3.2 Exploratory Analysis

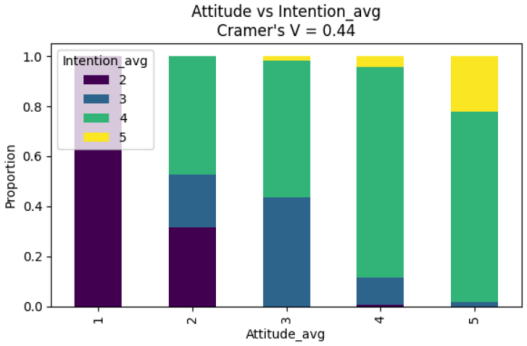
3.2.1 Associative Analysis

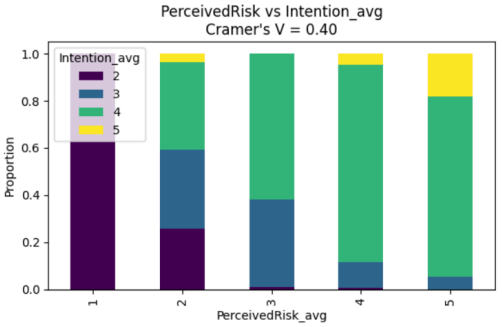
This analysis aims to uncover categorical variables and latent constructs that show a statistically significant association with consumers' Intention to Purchase Online during crisis periods. We used Cramer's V to measure association strength (0 = no association, 1 = perfect) , contingency tables and stacked bar charts to explore response distributions.

We analyzed grouped constructs (averaged Likert pairs) and other categorical variables (e.g., demographics, age, profession) with ≤10 unique values against the intension_avg score to identify meaningful associations.

Key Findings

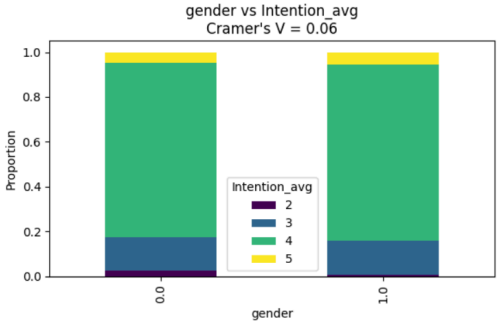
Variable	Cramer's V	Insight
Attitude	0.437	Strongest predictor of intention; respondents with positive attitudes showed high willingness to purchase online
Perceived Risk	0.398	Inverse relationship; lower risk perception leads to higher intention
Convenience	0.289	Perceived ease and time-saving strongly support intention
Information Sharing	0.286	A willingness to share personal shopping experiences correlated with higher purchase intention.
Word of Mouth & Recommendations	0.278	Positive recommendations and peer influence appeared to support higher intention levels.

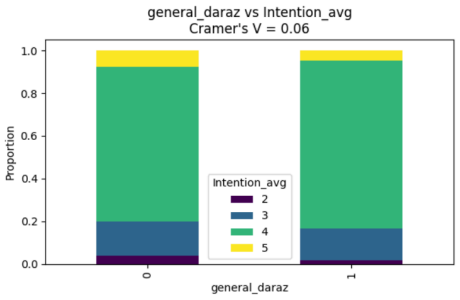




Non-Significant Associations

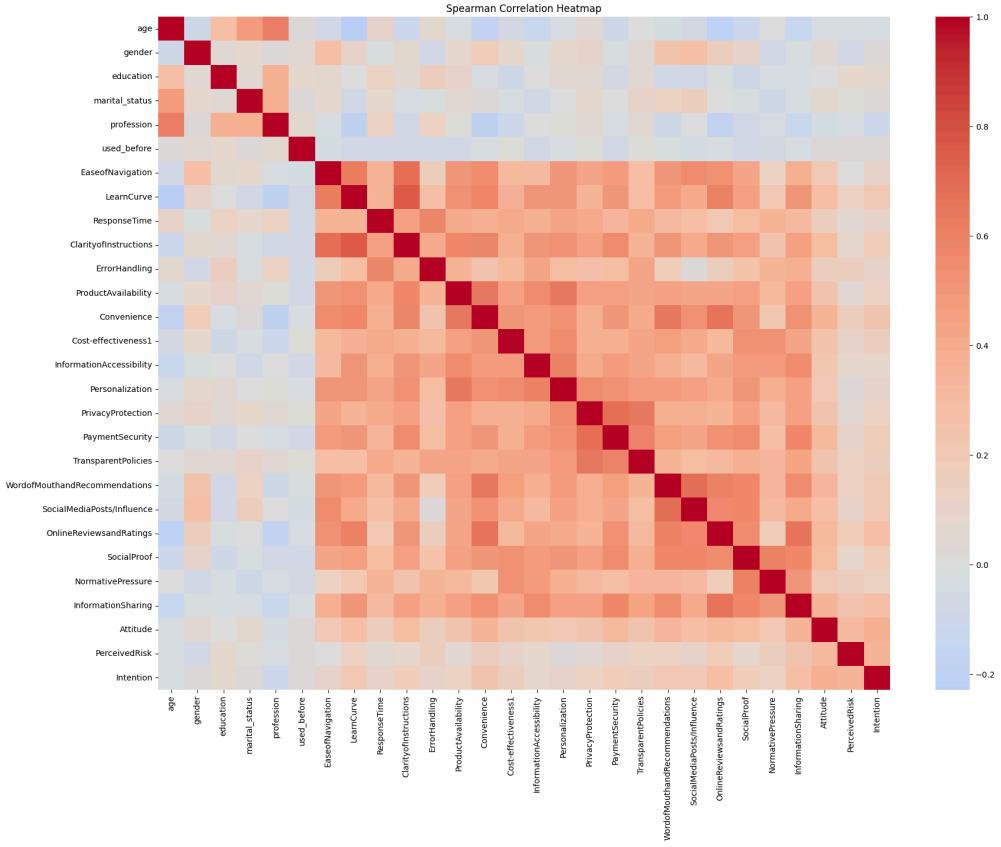
Widely used platforms like Daraz and Ubereats, along with demographics such as gender, age, and prior usage, showed weak or non-significant associations with purchase intention, indicating limited influence in this context.





The association analysis identified key variables that show strong and statistically significant relationships with online purchase intention. Constructs such as Attitude, Perceived Risk, and Convenience, along with influence-related factors like Information Sharing, emerged as the most relevant predictors. In contrast, demographic variables and platform usage showed little to no association. These results provide a clear foundation for selecting variables in the next phases.

3.2.2 Correlation Analysis



To explore the relationships between key variables, we conducted a Spearman correlation analysis. This method is appropriate for ordinal survey data. The figure shows the correlation heatmap of the main survey constructs, where darker colors represent stronger correlations.

Variable 1	Variable 2	Spearman
LearnCurve	Clarity of Instructions	0.761
Word of Mouth & Recommendations	Social Media Influence	0.687
Privacy Protection	Payment Security	0.670
Ease of Navigation	Clarity of Instructions	0.670
Online Reviews & Ratings	Information Sharing	0.664

The above table highlights the top variable pairs with relatively strong positive correlations. The strongest correlation was between LearnCurve and Clarity of Instructions ($\rho = 0.76$), suggesting that when instructions are clear, users feel they can learn the platform more easily. Other notable pairs included Word of Mouth and Social Media Influence ($\rho = 0.69$), and Privacy Protection and Payment Security ($\rho = 0.67$), indicating that trust and reputation-related factors are perceived as linked by users.We then examined the Spearman correlation between various predictor variables and the dependent variable — Intention to Purchase Online During Crisis. The values show that Attitude and Perceived Risk have moderate positive correlations with purchase intention, suggesting that consumers' mindset and perception of safety moderately influence their online shopping decisions during crises. In contrast, demographic factors such as age, gender, and profession show weak correlations, indicating that behavioral and psychological factors have a greater impact than personal characteristics.

3.2.3 Agreement and Reliability (Internal Consistency)

To ensure the quality of survey measurements used in analyzing online purchase intention, we evaluated item agreement and internal consistency across constructs. We employed two metrics:

- **Cohen's Kappa (κ)** for all **two-item constructs**, capturing pairwise agreement while adjusting for chance.
- **Krippendorff's Alpha ($\alpha_{ordinal}$)** for **multi-item constructs**, suitable for ordinal Likert-scale data and sets with ≥3 items.

We identified:

- **21 two-item pairs** (e.g., *Ease of Navigation1/2*)
- **1 multi-item set**: *Intention to Purchase Online* (originally 4 items)

After Analysing we obtain following results,

Sub Factor	Cohen's κ:
EaseofNavigation	0.752050
PaymentSecurity	0.738587
SocialMediaPosts/Influence	0.721599
SocialProof	0.710148
LearnCurve	0.694758
OnlineReviewsandRatings	0.692919
ClarityofInstructions	0.673470
InformationSharing	0.652689
PrivacyProtection	0.638721
ProductAvailability	0.602068
WordofMouthandRecommendations	0.601163
TransparentPolicies	0.600950
Convenience	0.599309
Personalization	0.565524
ErrorHandling	0.497859
Cost-effectiveness	0.467282
NormativePressure	0.425919
ResponseTime	0.422907
InformationAccessibility	0.385411
Attitude	0.301828
PerceivedRisk	0.280180

Cohen's κ:

- 11 constructs showed **substantial agreement** ($\kappa \geq 0.60$), including *Ease of Navigation (0.75)*, *Payment Security (0.74)*, and *Social Media Influence (0.72)*.
- 3 constructs, including *Perceived Risk ($\kappa = 0.28$)* and *Attitude ($\kappa = 0.30$)*, showed **fair or poor agreement**.

Krippendorff's $\alpha_{ordinal}$ (Before refinement):

- The 4-item *Intention to Purchase Online* scale produced a **very low $\alpha = 0.29$**, indicating unacceptable internal consistency.
- Upon **dropping Item 1** (which measured satisfaction rather than intention), α increased to **0.60**, meeting the acceptable threshold for exploratory analysis.

Sub Factor	Krippendorff's $\alpha_{ordinal}$	
	Before	After
IntentiontoPurchaseOnline	0.292032	0.59652

4. Hypothesis Testing

4.1 Main Hypotheses Results

1. Perceived ease of use has no impact on intention to purchase
   - **Statistical test used**: Spearman's Rank-Order Correlation
   - **Results**: $\rho = 0.194$, $p < 0.001$ (Rejected)
   - **Interpretation**: Perceived ease of use significantly correlates with consumers' intention to purchase online during crises. As ease of use increases, so does the likelihood of purchasing online.

2. Perceived usefulness has no impact on the intention to purchase online
   - **Statistical test used**: Spearman's Rank-Order Correlation
   - **Results**: $\rho = 0.190$, $p < 0.001$ (Rejected)
   - **Interpretation**: Perceived usefulness significantly influences intention to purchase. Users who find online shopping more useful are more likely to make purchases during crises.

3. Having structural assurance has no impact on the intention to make an online purchase
   - **Statistical test used**: Spearman's Rank-Order Correlation
   - **Results**: $\rho = 0.181$, $p < 0.001$ (Rejected)
   - **Interpretation**: Structural assurance, such as security and clear policies, significantly affects

purchase intention, indicating trust is a key factor.

4. Social influence has no impact on the intention to purchase online
    - **Statistical test used**: Spearman's Rank-Order Correlation
    - **Results**: $\rho = 0.257$, $p < 0.001$(Rejected)
    - **Interpretation**: Social influence strongly impacts online purchase intentions, implying that peer recommendations and reviews significantly shape consumer behavior.

5. The attitude towards online shopping does not mediate the relationship between perceived ease of use and the intention to purchase online
    - **Statistical test used**: Multiple Regression (Baron & Kenny method)
    - **Results**: $p < 0.001$ (Rejected); PEOU effect reduced from $\beta = 0.254$ to $\beta = 0.090$
    - **Interpretation**: Attitude partially mediates the relationship. Even though PEOU predicts intention, the introduction of attitude reduces its direct effect, indicating a meaningful mediating role.

6. Perceived Risk mediates the relationship between Perceived Usefulness and Intention to Purchase Online during a crisis in Sri Lanka
    - **Statistical test used**: Multiple Regression (Baron & Kenny method)
    - **Results**: $p < 0.001$ (Rejected); PU effect decreased from $\beta = 0.238$ to $\beta = 0.168$
    - **Interpretation**: Perceived risk mediates the relationship between usefulness and purchase intention. As perceived usefulness increases, perceived risk decreases, leading to increased intention to buy.

7. Ease of navigation has no impact on the intention to purchase online
    - **Statistical test used**: Spearman's Rank-Order Correlation
    - **Results**: $\rho = 0.142$, $p < 0.001$ (Rejected)
    - **Interpretation**: Ease of navigation has a significant positive effect on purchase intention, highlighting the importance of user-friendly interfaces.

8. Clarity of instructions has no impact on the intention to purchase online
    - **Statistical test used**: Spearman's Rank-Order Correlation
    - **Results**: $\rho = 0.206$, $p < 0.001$ (Rejected)
    - **Interpretation**: Clear instructions during the online shopping process significantly improve users' willingness to complete purchases.

9. Response Time has no impact on intention to purchase online
    - **Statistical test used**: Spearman's Rank-Order Correlation
    - **Results**: $\rho = 0.076$, $p \approx 0.029$ (Rejected)
    - **Interpretation**: Although the correlation is weaker, faster response times still show a statistically significant influence on increasing purchase intention.

10. Error handling has no impact on intention to purchase online
    - **Statistical test used**: Spearman's Rank-Order Correlation
    - **Results**: $\rho = 0.149$, $p < 0.001$ (Rejected)
    - **Interpretation**: Effective error handling boosts user confidence and significantly supports their intention to purchase during online shopping.

4.2 Custom Hypotheses

1. Personalization has no impact on intention to purchase online.
    - **Statistical test used**: Spearman Correlation
    - **Results**: $\rho = 0.060$, $p = 0.083$ (Fail to Reject H_0)
    - **Interpretation:** Personalization does not significantly influence purchase intention.

2. Word of mouth has no impact on the intention to purchase online.
    - **Statistical test used**: Spearman Correlation
    - **Results**: $\rho = 0.195$, $p < 0.001$ (Reject H_0)
    - **Interpretation**: Word of mouth significantly enhances purchase intention.

3. Normative pressure has no impact on intention to purchase online.
    - **Statistical test used**: Spearman Correlation
    - **Results**: $\rho = 0.111$, $p = 0.0014$ (Reject H_0)
    - **Interpretation**: Social pressure meaningfully contributes to online purchase intention.

4. Learning curve has no impact on the intention to purchase online.
    - **Statistical test used**: Spearman Correlation
    - **Results**: $\rho = 0.221$, $p < 0.001$ (Reject H_0)
    - **Interpretation**: Platforms that are easy to learn encourage online purchasing.

5. Privacy protection has no impact on intention to purchase online.
    - **Statistical test used**: Spearman Correlation
    - **Results**: $\rho = 0.107$, $p = 0.0021$ (Reject H_0)
    - **Interpretation**: Better privacy protection increases intention to purchase.

6. Perceived risk does not mediate the relationship between social influence and intention.
    - **Statistical test used**: Mediation Analysis
    - **Results**: Partial mediation confirmed (all $p < 0.001$) (Reject H_0)
    - **Interpretation**:Perceived risk partly explains how social influence affects purchase intention.

7. Age does not moderate the relationship between perceived usefulness and intention.
    - **Statistical test used:** Moderation Analysis (interaction term)
    - **Results**: Interaction $p = 0.013$ (Reject H_0)
    - **Interpretation**:The effect of perceived usefulness on intention varies with age.

8. Marital status does not moderate the relationship between perceived ease of use and intention.
    - **Statistical test used**: Moderation Analysis
    - **Results**: Interaction $p = 0.149$ (Fail to Reject H_0)
    - **Interpretation**: The effect of PEOU on intention is consistent regardless of marital status.

9. Gender does not moderate the relationship between perceived usefulness and intention.
    - **Statistical test used**: Moderation Analysis
    - **Results**: $p > 0.05$ (Fail to Reject H_0)
    - **Interpretation**: The effect of perceived usefulness on intention is not influenced by gender.

10. Convenience has no impact on intention to purchase online.
    - **Statistical test used**: Spearman Correlation
    - **Results**: $\rho = 0.240$, $p < 0.001$ (Reject H_0)
    - **Interpretation**: Convenience significantly boosts the likelihood of online purchasing.

5. Rule Mining

To uncover hidden patterns in consumer perceptions during the crisis, we applied the **Apriori algorithm** to the preprocessed survey data (n = 825). Each respondent was treated as a "transaction," and their average Likert-scale responses to key constructs were categorized into **High**, **Neutral**, or **Low** levels.

5.1 Methodology

We focused on the **High** and **Low** categories excluding *Neutral* to surface more decisive consumer opinions. The dataset was converted into a one-hot encoded binary matrix where each column represented a perception level, such as *High PU* or *Low PU*. The following parameters were applied:

- **Support threshold**: 0.05
- **Confidence threshold**: 0.65

- **Minimum lift**: 2.0
- **Filtering**: Only rules containing *High* or *Low* levels were retained, and the top five were selected based on lift.

The Apriori process was implemented using the *mlxtend* library in Python.

5.2 Results

The five strongest rules are summarized in the Table below. Each rule highlights co-occurring perceptions that are especially pronounced during the crisis period.

Rule #	Rule (IF → THEN)	Support	Confidence	Lift
1	High Attitude ∧ High PEOU → High PU	0.052	0.65	4.30
2	Low PU → Low PEOU	0.112	0.71	3.56
3	Low PU ∧ High Risk → Low PEOU	0.062	0.69	3.47
4	High PU ∧ High Social Influence → High Attitude ∧ High Intention ∧ High Risk	0.052	0.70	2.32
5	High PU ∧ High Risk ∧ High Social Influence → High Attitude ∧ High Intention	0.052	0.78	2.11

Abbreviations: *Intention to Purchase Online (Intention); Perceived Usefulness (PU); Perceived Ease of Use (PEOU).*

5.3 Interpretation and Managerial Takeaways

- **Rule 1**: Users with a positive attitude and a smooth experience are four times more likely to find the platform useful.
  - Invest in both UX enhancements and emotional branding to elevate perceived usefulness.
- **Rule 2**: Poor value perception strongly correlates with perceived difficulty of use.
  - Ensure the value proposition is immediately visible to prevent negative usability judgments.
- **Rule 3**: When shoppers perceive both low value and high risk, their experience worsens and usability scores drop.
  - Address value and trust concerns in tandem, fixing only one will not suffice.
- **Rule 4:** Social influence and perceived usefulness push attitude and intention high , even if perceived risk stays high.
  - Leverage influencer reviews and utility messaging, but pair them with visible trust cues (e.g., secure checkout).
- **Rule 5**: Even risk-aware consumers intend to buy when usefulness and social buzz are strong.
  - Bundle "utility" with social proof; risk alone won't deter purchases if both are convincing.

6. Discussion

This study examined key factors influencing online purchase intentions among Sri Lankan consumers during crises. Our analysis, based on 836 survey responses, highlighted Attitude and Perceived Risk as pivotal factors significantly influencing purchase intentions. Positive attitudes towards online shopping strongly predicted increased purchase intentions, while higher perceived risk negatively impacted consumer willingness.

The analysis of usability and practicality revealed significant influences from Perceived Ease of Use (PEOU) and Perceived Usefulness (PU), with Ease of Navigation and Clarity of Instructions showing particularly strong effects.

Conversely, Response Time had a weaker effect, suggesting that clear navigation and usability are more crucial to consumer satisfaction. Social dynamics, including Word of Mouth and Information Sharing, significantly shaped consumer behavior, emphasizing the importance of social influence during crises.

Rule mining further reinforced these insights, highlighting that consumers with high attitude and ease of use perceptions found platforms notably more useful, suggesting a synergy between usability and emotional engagement. Conversely, low perceived usefulness correlated with negative perceptions of ease of use, heightened perceived risk.

For Wolt, these findings suggest strategic investments in enhancing user experience, clear communication of platform security, leveraging peer recommendations, and integrated marketing to emphasize platform convenience and ease of use.

Despite methodological strengths such as comprehensive data analysis, limitations included lower reliability scores for Attitude and Perceived Risk constructs. Future studies should address these limitations by refining measurement instruments and considering longitudinal and experimental approaches for deeper insights.

7. Recommendations

Based on our findings, we recommend that Wolt dropping the inconsistent "Intention1" item to enhance the Intention to Purchase scale reliability.

The Attitude ($\alpha = 0.514$) and Perceived Risk ($\alpha = 0.463$) scales demonstrated poor internal reliability, indicating the need for revision. To enhance the accuracy and consistency of these constructs, it is recommended to reword the existing items for improved clarity and add new items that better capture the full range of their underlying dimensions.

Rule mining revealed that improving UX and highlighting value boosts perceived usefulness, while addressing both risk and value is essential. Social influence increases purchase intention even under high risk. Wolt should combine emotional branding, trust cues, and peer validation to convert hesitant shoppers during crises

8. Conclusion

This project explored the key factors influencing online purchase intentions during crises among Sri Lankan consumers. Through comprehensive data analysis, we found that psychological and experiential factors - particularly Attitude, Perceived Risk, Ease of Use, and Social Influence - play a more significant role than demographics or platform familiarity. The hypothesis testing and rule mining confirmed that enhancing usability and reducing perceived risk can substantially boost consumer intention. To ensure more reliable insights in future studies, we recommend refining measurement instruments by removing low-consistency items like *Intention1* and revising weak constructs. These findings provide actionable guidance for Wolt to tailor its digital strategies and strengthen consumer engagement during crisis periods.

References

1. Davis, F. D. (1989). *Perceived usefulness, perceived ease of use, and user acceptance of information technology*. MIS Quarterly, 13(3), 319–340.
2. GeeksforGeeks. (n.d.). *Association rule – Data Mining*. GeeksforGeeks.
3. Laerd Statistics. (n.d.). *Cohen's Kappa in SPSS Statistics*. Laerd Statistics.
4. Statistics How To. (n.d.). *Spearman's Rank-Order Correlation*. Statistics How To.