

Consumer Behavioral Data Analysis for Decision Making Process: Cognitive and Emotional Factors

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Abstract:- Despite the crucial role of emotion in decision-making, research has yet to fully describe how viewers effectively use emotional content. While an increasing body of research explores the emotions at work in consuming settings, a greater understanding of consumers' emotional coping capacities has the potential to impact business success outcomes. The current study examines the effect of emotional intelligence on consumer decision-making and quantifies consumers' emotional capacities using a survey of social network users. Additionally, empathy, personality, and emotional intelligence are evaluated as distracting factors in the current project that mediate and affect consumer decision-making. The current project distinguished itself by its application of data analysis methods to psychometrics. Five psychometric scales measuring empathy quotient and personality factors, emotional and cognitive aspects, were distributed to participants to help them understand how consumers to make personal decisions. After collecting the data, it was analyzed, ensuring that it was in a format appropriate for applying the respective machine learning algorithms used in the R package. The current research found that emotional capacity predicts consumer success independently of cognitive ability, demonstrating the construct's significance in consumer behaviour.

Keywords:- Behavioral Data, Empathy, Decision Making, Consumer Ability, Machine Learning.

I. INTRODUCTION

Emotions and personality play a significant role in judgement and decision-making because they convey critical knowledge about who we are and how we communicate

with others. Nothing is understood on how emotions influence marketing efficiency. When applied to ads, emotional ideas have resulted in studies focusing on:

- Emotion as a precursor to actions.
- Emotion as a consequence.
- Emotions as a moderating or influencing factor in marketing relationships.

What function do emotions play in interactions and relationships, and how do customers make marketing decisions based on emotional information? These issues must be thoroughly investigated. This study used the semantic concept of emotional intelligence and its connection with personality dimensions of the consumer to include some potential answers (Gkintoni et al., 2015).

1.1. Consumer emotional ability scale (CEAS)

The Consumer Emotional Ability Scale examines the importance of emotional factors as predictors, consequences, moderators, and mediators of action in a consuming environment. Collecting and using emotional (or cognitive) knowledge in order to achieve an objective requires collecting and using this data. The CEAS governs advertising's use of emotional intelligence and its relationship to behavioral performance. Scale based on the presence or absence of four basic emotional capacities (i.e., perceiving, facilitating, understanding, managing). This instrument allowed a more detailed examination of the impact of emotional intelligence on consumer relationship performance. A Four-Branch Model of Consumer Emotional Intelligence A summary of the skill is as follows: a) Perceiving Emotion, b) Facilitating Emotion, c) Understanding Emotion, and d) Managing Emotion (Figure 1).

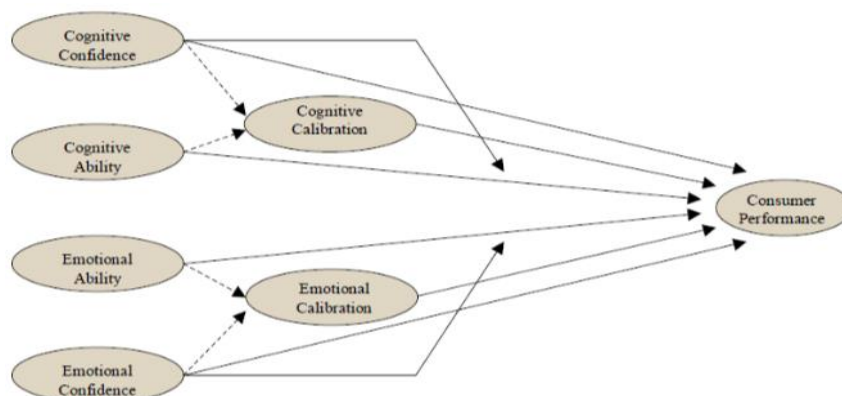


Figure 1 - CEAS Scale

1.2. The Empathy Quotient (EQ)

Empathy, according to the emotional approach, is described as the observer's emotional response to another's emotional state. Empathy allows one to comprehend the intentions of another, anticipate their actions, and experience a feeling caused by their movement. As a result, our sympathy helps one to navigate social environments effectively, motivates us to help others, and prevents us from harming others (Baron-Cohen & Wheelwright, 2004).

A simple illustration showing how empathy is composed of two overlapping elements and how compassion is a subset of the affective portion (Figure 2).

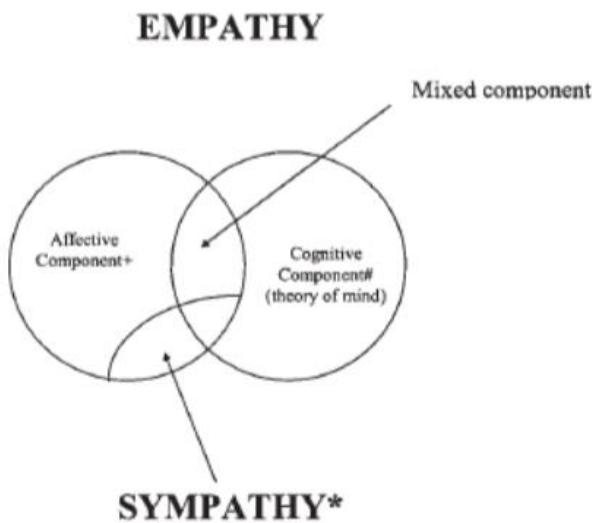


Figure 2 – EQ Scale

The Empathy Quotient (EQ) was designed to be short, straightforward in administration, and straightforward in scoring. The EQ is composed of 60 items split into two categories: 40 items that measure empathy and 20 items that serve as filler. The twenty filler objects were used to deflect the participant's attention away from an unwavering focus on empathy. Although empathy is a necessary component of normal social functioning, there are relatively few resources for assessing individual differences in this domain. In this article, we modified this self-report questionnaire for use with adults of average intelligence.

1.3. The Balanced Emotional Empathy Scale (BEES)

The Balanced Emotional Empathy Scale (BEES) is a measure of empathy's emotive aspect. Typically, the construct of empathy has been divided into two categories: logical and mental. Cognitive empathy is the capacity to comprehend another person's emotions, fears, and behaviors imaginatively. Emotional empathy is the capacity to sense another person's emotion while retaining a caring, other-centered viewpoint. The questionnaire above indicates the presence of five elements of emotional intelligence (Mehrabian, 1996).



Figure 3 - BEES Scale

Self-awareness: This aspect of emotional intelligence serves as the foundation for all other elements. Self-awareness entails being mindful of your feelings and emotions.

Emotional management: Emotional intelligence's second critical aspect is emotional management. This means that you can manage your emotions in such a way that worry, anxiety, terror, or frustration do not get in the way of getting things done. Individuals that are able to control their feelings do well and they can think straight.

Self-motivation: This capacity for optimism and hope in the face of challenges, failures, and even sheer disappointment is critical for achieving long-term goals in life or industry.

Empathy is the fourth part, and it refers to the ability to position oneself in another person's shoes—to understand what others are feeling without them having to express it.

The final component of emotional intelligence is social competence. This capacity to communicate with people, form meaningful relationships, respond to others' feelings, and affect others is the final component of emotional intelligence (Figure 3).

1.4. Eysenck Personality Questionnaire (EPQ)

Eysenck's personality measurements are distinct categories of individuals, each with a unique collection of characteristics traceable back to their behaviors and reactions. What is suggested is specifically the identification of an individual's unique reactions, which would provide proof of his normal reactions and therefore of his typical behaviour. This enables assumptions to be made on some aspects of his personality. These characteristics are regarded as the components of each of the three dimensions of personality (types). Because of the association between responses and their normal presence, they serve as valid guidelines for ascribing specific attributes to a person's personality. That is, measurements or forms of personality

are concepts that include a set of closely associated traits that we deduce from an individual's reactions and behaviour. In depth, the three suggested personality measurements are as follows:

- **Extraversion-introversion:** An extrovert is outgoing, enjoys group activities, has a large social circle, and dislikes reading and learning. Additionally, has a strong appetite for emotion, never misses an opportunity, enjoys risk, responds quickly, and is usually impulsive.
- **Neurotism - Dysfunction - Mental Stability:** Neurotism is a term that applies to an individual's overall emotional instability, emotional hyperactivity, and proclivity for developing neurotic symptoms in response to stress.
- **Psychoticism:** Further examination of Eysenck's personality dimensions reveals an additional personality variable that appears in the community as a whole - that is, in stable and divergent individuals - in the form of response patterns and is predictive of the future emergence of psychotic elements. This variable, dubbed "Psychotism" (P), corresponds to subjective personality characteristics.

These findings resulted in the establishment of a measuring scale for the three personality variables (E, N, and P), as well as a supplementary variable for the L, which quantifies the falsity of the responses provided by the individual questioned during the questionnaire. The Eysenck pair introduced a new scale in 1975, dubbed the Eysenck Personality Questionnaire (E.P.Q.).

1.5. Trait Emotional Intelligence (EI)

The standardized scale Trait Emotional Intelligence (TEIQue) is used to measure, monitor, and evaluate emotional intelligence. It is based on K.V. Petrides' Trait model of EI. The Trait Emotional Intelligence Questionnaire is a self-report questionnaire that was designed to comprehensively cover the trait EI sampling area.

The scale consists of fifteen subscales grouped into four factors:

- **Well being:** This aspect is composed of three distinct characteristics: Happiness, Optimism, and Self-esteem.
- **Self control:** The self-control dimension indicates how much individuals believe they can control or are influenced by their urges. It is composed of three distinct personality characteristics: Impulse Control, Emotional Regulation and Stress Management.
- **Emotionality:** This factor is made up of four distinct characteristics: Emotion Perception, Emotion Expression, Empathy and Relationships. They together reflect the level of awareness of your own emotions and feelings, as well as the emotions and feelings of others.
- **Sociability:** This attribute indicates how at ease people are in a variety of social situations, from celebrations and social events to formal business meetings.

II. METHODOLOGY

The technique used comprises of three distinct stages. Electronic questionnaires were generated and distributed during the first process through the website <http://www.cicos.gr>. Following that, data from the questionnaires were gathered and preprocessed. The data set for study included demographic information about respondents, such as ethnicity, birthplace, current residence, educational history of respondents and their parents, and parents' professional occupation, as well as subscales from the CEAS, EQ, BEES, EPQ, and TEIQue studies. The third process involved analyzing the data collection using Data Mining methods and evaluating the findings. More precisely, we used classification algorithms to explain the data's hidden patterns. Decision trees are an effective tool for representing and facilitating psychological statement analysis. They are composed of consecutive decisions and variable outcomes over a specified time frame.

1.6. Personality, Empathy, Emotion Ability/ Intelligence in Consumer Behavior

A deeper understanding of emotional capacity will significantly contribute to our understanding of consumer behavior. For instance, it may shed light on the following questions: how does emotional processing impact purchasing decisions; which choices do consumers with a high versus a low EI make more readily; and how might EI affect relationships between key customer variables such as impulsivity and purchase intention (*Halkiopoulos et al., 2020a*). Additionally, by gaining an understanding of emotional capacity, we can be able to distinguish the consumers make the highest (and lowest) quality consumer decisions. For example, consumers with a high level of nutrition awareness who lack the emotional capacity to recognize which emotions are necessary and how to handle them in the direction of unhealthy eating are more likely to make poor quality choices (*Halkiopoulos et al., 2020b*). Recognizing these emotional shortcomings will help to enhance the consistency of consumption decisions in the future.

In terms of the impact of personality characteristics on consumer behavior, recent developments in personality research allow us to forecast consumer motivation (*Gkintoni et al., 2016*). The term "traits" refers to enduring and consistent patterns of actions, attitudes, and emotions that differ between individuals. Historically, researchers have been motivated by an interest in understanding how individuals differ, and thus have expended considerable effort determining how to quantify, chart, and describe personality traits. Attempts have been made to describe personality traits by trait theory. According to trait theory, personality is composed of a set of quantifiable attributes or units referred to as traits. Traits are relatively stable predispositional characteristics (*McLeod, 2014*). Each personality is composed of a specific set of characteristics, and given their consistency, individuals possessing a given set of characteristics can be expected to behave consistently through situations and over time. Gordon Allport, Henry Odbert Raymond Cattell, and Hans Eysenck are credited

with pioneering the invention of trait theory (Myers, 1995; Burger, 2000; Franzoi, 2002). The present paper investigates Eysenck's theory of traits. Eysenck (1947) created a personality model focused on three characteristics: "introversion/extroversion, neuroticism/emotional stability, and psychoticism" (Franzoi, 2002: 398).

1.7. Data Mining Techniques

Data mining is a relatively recent technique for knowledge discovery that entails retrieving previously unknown, actionable information from massive science and commercial datasets. This is necessitated by the exponential growth in the number of such databases. Data mining processes typically extract rules from vast quantities of categorical and/or numerical data. Classification, clustering, and association are the three most well-known data mining activities. Classification is an often-used data mining technique. Classification aims to derive information that can be used to classify data into predefined categories, each identified by a set of attributes. Numerous schemas are possible for describing the extracted data.

Graph-based visualization

Although graph-based visualizations have an extremely simple description of laws, they are prone to being cluttered and are therefore only feasible with very small sets of rules (Figure 4).

Grouped Matrix Visualization

Clustering is used to organize the antecedents (columns) in the matrix. In the matrix, groups are represented by balloons (Figure 5).

III. RESULTS

1.8. Association Rule Learning

Association rule learning is a form of machine learning technique that uses rules to discover interesting relationships between variables in large datasets. It is intended to identify discovered strong rules in databases by the use of certain interestingness measures. Typically, they must meet both a user-defined minimum level of assistance and a user-defined minimum level of confidence. Apriori is a database mining algorithm for mining commonly occurring object sets and analyzing association rules. This is accomplished by identifying the most frequently occurring individual items in the database and extending them into larger and larger item sets as long as those item sets are frequently occurring in the database. Apriori's frequent item sets can be used to generate association rules that demonstrate the database's general patterns.

Visualizing Extracted Rules

Visualization has a long tradition of making large data sets more accessible with the use of methods such as filtering and peeking. In this article, we discuss relation laws using the R-extension package "arulesViz," which combines a variety of well-known and novel visualization techniques. We explain how to view the derived laws in a variety of ways using a variety of different techniques in the section below.

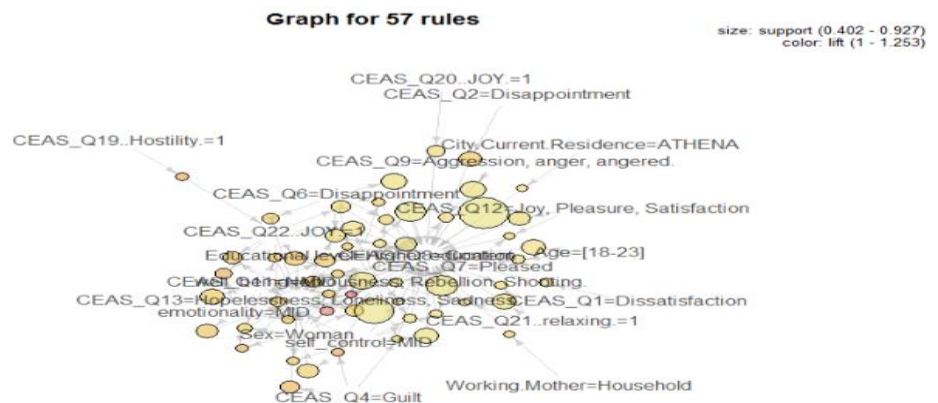


Figure 4 – Graph Rules

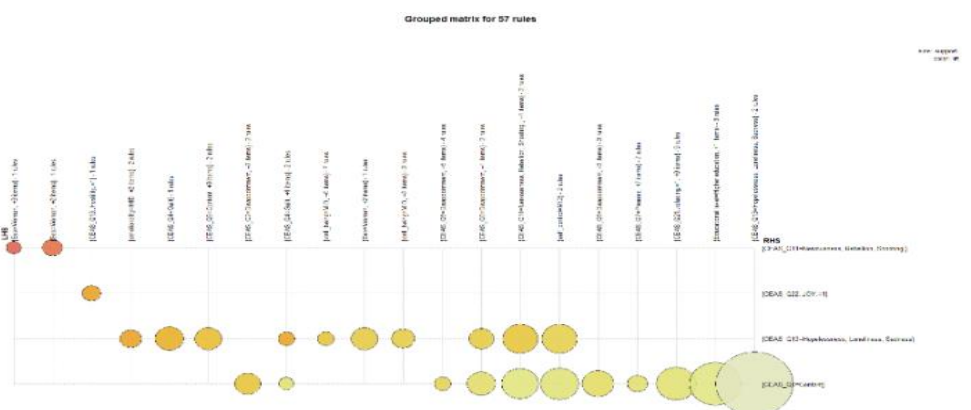


Figure 5 – Grouped Matrix Visualization

Parallel coordinates visualization

Parallel coordinate plots are used to visualize multi-dimensional data (Figure 6).

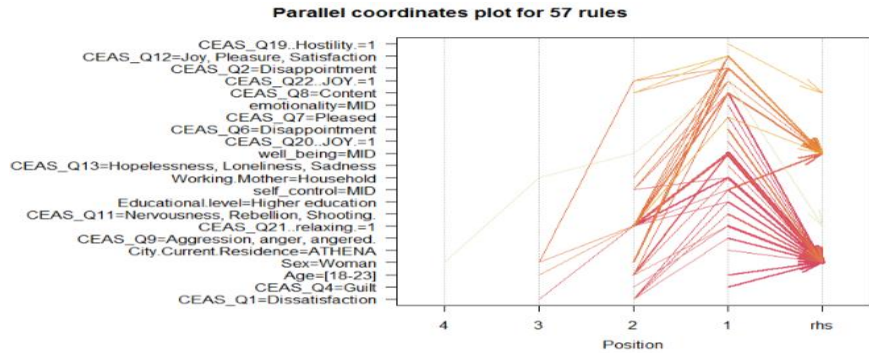


Figure 6 – Parallel coordinates visualization

Apriori rules

lhs	rhs	support	confidence	lift
1 {Sex=Woman, Educational.level=Higher education, CEAS_Q8=Content, CEAS_Q13=Hopelessness, Loneliness, Sadness}	=> {CEAS_Q11=Nervousness, Rebellion, Shooting.}	0.4024390	0.9166667	1.252778
2 {Sex=Woman, Educational.level=Higher education, CEAS_Q13=Hopelessness, Loneliness, Sadness}	=> {CEAS_Q11=Nervousness, Rebellion, Shooting.}	0.4390244	0.9000000	1.230000
3 {CEAS_Q19..Hostility.=1}	=> {CEAS_Q22..JOY.=1}	0.9210526	1.144338	0.4268293
4 {CEAS_Q22..JOY.=1, emotionality=MID}	=> {CEAS_Q13=Hopelessness, Loneliness, Sadness}	0.4756098	0.9750000	1.142143
5 {Sex=Woman, emotionality=MID}	=> {CEAS_Q13=Hopelessness, Loneliness, Sadness}	0.4268293	0.9722222	1.138889

**6 {CEAS_Q4=Guilt,
CEAS_Q11=Nervousness, Rebellion, Shooting.} =>
{CEAS_Q13=Hopelessness, Loneliness, Sadness}**
0.4146341 0.9714286 1.137959

The exported laws following data mining analysis of the findings was analyzed as follows: To begin, females (18-21 years old) demonstrated lower sociability and emotionality than males in the same age group. Males (age range: 22-24) exhibit average levels of emotionality, sociability, and well-being, while females in this age range exhibit elevated levels of sociability. Males and females (age range: over 25 years) exhibit average rates in all four TEIQue variables.

Principal Component Analysis

PCA is a mathematical technique that employs an orthogonal transformation to translate a series of measurements of potentially clustered variables into a collection of values of linearly uncorrelated variables referred to as principal components, or sometimes, principal modes of variation (Figure 6).

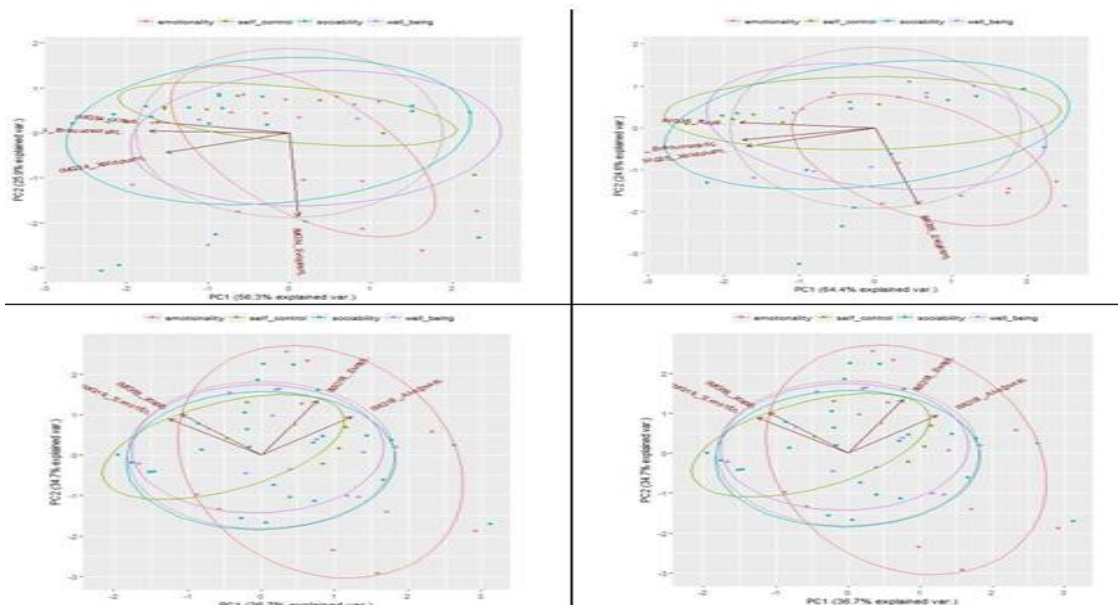


Figure 6 – PCA Analysis

1.9. Regression Analysis

A linear regression model was used to derive correlations between emotionality and images since it allows for the presentation of statistical significance through p. When the zero hypothesis is valid, the p-value is defined as the probability of having an effect equal to what was actually observed.

The emotionality index plays a unique role in shaping the values of each subset of each image. The objective is to ascertain the degree to which this position exists. The base measurement (p-value) steps are: a) Very High Significance, b) High Significance, c) Normal Significance, d) Limit Importance, e) Not at all important

Image 12	Image 9
Normal significance in the "Concern" index	Marginal significance in the Relaxation Index
Image 13	Image 3
Normal significance in the "Fear" index and high significance in the "Anger" index	Normal significance in the "Aggressiveness" index
Image 14	Image 4
Normal significance in the index "Abnormality"	Normal significance in the "Enthusiasm" index and the "Inconvenience" index
Image 11	Image 5
Normal significance in the "indifference" index and high significance in the index "Disgust"	Marginal significance in the "Enthusiasm" index and normal significance in the "Discomfort" index
Image 2	Image 30
No significance	High significance in the "Enthusiasm" index and the "Inconvenience" index
Image 8	Image 31
No significance	Marginal significance in the "Infertility" index
Image 19	Image 25
Marginal significance in the "Fraud" index and high significance in the "Anger" index	No significance
Image 23	

IV. CONCLUSION

One general conclusion can be drawn from the data in order to understand the consumer behaviour of young adults on social media. This paper can be used in the field of marketing to decipher psychological problems associated with young adulthood, specifically in the areas of emotional capacity, disposition, and empathy between males and females.

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