Understanding Apple Attribute Preferences of US Consumers

Subjects: Behavioral Sciences

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Definition

An encyclopedia entry to enhance the understanding on fresh apples- building on the work of Meike Rombach, David Dean and Tim Baird

Fresh apples are a commonly consumed and widely available product in food markets around the world.

1. Introduction

Apples as a horticultural consumer good are comprised of various product attributes, some of which may have varying levels of importance for consumers. Relevant consumer attributes possessed by fresh apples include the colour of the skin, shape, aroma, apple variety, texture and the length of their shelf life [1][2][3][4]. This latter attribute is particularly important, as even though apples have good storing qualities, they are ultimately perishable [5][6][7]. Colour and appearance are crucial in retail situations as they attract the consumer's attention. Colour often serves as a cue for fruit quality; consumers commonly attempt to estimate the texture of apples as this gives them an indication of the taste [8]. Extant literature in this area classifies consumers into two main categories: those who prefer firmness, juiciness, and bit of acidity in apples, and those that who like sweeter, but less firm apples [9]. In addition to these product attributes which are inherent to the apple (intrinsic attributes), consumers are also interested in commercial attributes, such as price, packaging, branding, country of origin, and sustainability [10][11][12]. These are linked to the production, distribution, and presentation of apples (extrinsic attributes) [13][14][15][16][17]. Although early studies on horticultural and agricultural products have emphasised the importance of intrinsic attributes for consumers, more recent studies show that for agricultural and horticultural products external attributes are equally important for consumers [18][19][20][21][22]. Consumer choices regarding apple attributes, as well as the willingness to pay for fresh or processed apple products has been intensively studied in the US [23][24][25]; Consumer choice relies on a trade off between bundles of intrinsic and extrinsic product attribute; these include aspects of consumers personal backgrounds, including their sensory preferences and attitudes [26]. However, key-factors which lead to the determination of apple preferences are not as widely studied. In the following sub sections these factors are explained in more detail as they underpin the conceptual framework for this study. US consumers' objective and subjective knowledge, as well as their sociodemographic backgrounds, their discernment as a buyer and their attitudes towards apple growers are likely to be key factors in determining the importance that US consumers place on physical and commercial apple attributes.

2. Apple Buyer Discernment

For the US food retail industry, as well as for the horticultural industry, it is important to know consumer preferences for new and existing varieties, as well as their ability to distinguish varieties [27]. This allows businesses to offer products that consumers need and want, and enables marketers to differentiate their products from existing ones. Very few studies have focused on the perception of apple varieties and the ability of consumers to distinguish them [27]. Studies which have shown that consumers are necessarily able to distinguish apple varieties have found that mostly neophobia or neophilia determines preference or aversion towards new apple varieties [23][27]. In the US, new varieties are often termed as club varieties [23]. Club varieties are subject to patent-protection. Growers who are part of the club have exclusive rights to produce and market the club variety as stipulated by a licensing contract. This includes both fruit quality and quantity [28]. Common examples of club varieties on the US market are 'Jazz™', 'SnowSweet®', 'Sweet Sixteen', 'SweeTango®', 'Zestar!™', and 'Pink Lady®' [23]. Examples of more

traditional varieties are ‘Red’ and ‘Golden Delicious’, ‘Granny Smith’, ‘Fuji’, ‘Honeycrisp’, ‘McIntosh’, ‘Cripps Pink’ [29]. Given that the majority of consumers do not possess a good varietal knowledge, marketing promotions, such as tasting experiences which offer free samples coupled with promotional materials regarding varietals are crucial to improve the ability of consumers to distinguish amongst different varieties [28].

3. Current Insight on Apple Attribute Preferences of US Consumers

The descriptive statistics of the sample are displayed in **Table 1**. The median respondent was aged between 25 and 34 years, had obtained a bachelor degree, and earned an annual pre-tax income ranging between USD 25,000 to USD 50,000 per year. Additionally, the other scale measured in the model was the objective apple knowledge score, which had a mean of 1.02, a range of between −4 to +5, and a standard deviation of 1.834.

Table 1. Sample description.

	Freq	%	Median	StDev
Age				
Under 21	2	0.5		
21–24	16	4.2		
25–34	215	56.1	✓	0.940
35–44	104	27.2		
45–54	27	7.0		
55–64	14	3.7		
65+	5	1.3		
Total	383	100		
Education				
Did not finish high school	6	1.6		
Finished high school	46	12.0		
Attended University	40	10.4		
Bachelors Degree	223	58.2	✓	0.927
Postgraduate Degree	68	17.8		
Total	383	100		
Household Annual Income				
USD 0 to 24,999	80	20.9		
USD 25,000 to 49,999	117	30.5	✓	1.141
USD 50,000 to 74,999	119	31.1		
USD 75,000 to 99,999	40	10.4		
USD 100,000 or higher	27	7.0		
Total	383	100		
Gender				

	Freq	%	Median	StDev
Male	196	51.2	✓	0.501
Female	187	48.8		
Total	383	100		
US Geographical Distribution				
North-East	83	21.7		
Mid-West	133	34.8		
South	90	23.5		
West	77	20.1		
Total	383	100		

The measurement model assessment included the use of reliability to test the model constructs, as well as the use convergent and discriminant validity to conduct further checks. All items achieved a factor loading of well above the minimum of 0.4, indicating their suitable contribution to the scale (see **Table 2**). Reliability was confirmed by both the Cronbach Alpha and composite reliability scores being above 0.6. Convergent validity was also indicated by AVE scores being higher than 0.5 for all the scales. Given that all indicators were within acceptable ranges, the requirements of construct reliability and validity were considered satisfactory [30].

Table 2. Scale loadings, reliabilities, and convergent validity.

Scales and Items	Factor Loadings	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Discerning Apple Buyer		0.836	0.877	0.504
How similar are Pink Lady and Cosmic Crisp	0.741			
How similar are Granny Smith and Royal Gala	0.731			
How similar are Pink Lady and Cripps Pink	0.706			
How similar are McIntosh and Braeburn	0.749			
How similar are Zestar! and Sweet Tango	0.718			
How similar are Fuji and Red Delicious	0.639			
How similar are Red Delicious and Golden Delicious	0.680			
Importance of Apple Commercial Attributes		0.701	0.817	0.527
Importance of—Price	0.702			
Importance of—Labelled as sustainable	0.719			
Importance of—Labelled as traditional varieties such as Royal Gala, Braeburn, Granny Smith	0.735			
Importance of—Labelled as club apples such as Pink lady or Cosmic Crisp	0.747			
Importance of Apple Physical Attributes		0.723	0.825	0.543
Importance of—Colour of the skin is true to variety	0.773			

Scales and Items	Factor Loadings	Cronbach's Alpha	Composite Reliability	Average Variance Extracted
Importance of—Smell is appealing	0.700			
Importance of—Texture is soft	0.793			
Importance of—Skin is free of visual blemishes	0.673			
My Attitudes towards US Apple Growers		0.836	0.880	0.552
I think that US growers have a longstanding tradition and lots of experience in growing sustainable apples.	0.728			
I think that US apple growers contribute to the care and maintenance of the landscape	0.678			
I think that US apple growers make active contributions to preserve biodiversity	0.841			
I think that US apple growers treat land resources responsible	0.707			
I think that social pressure on apple growers should be increased as they are main agents of climate change.	0.665			
I think that US apple growers are environmental conscious	0.821			
Subjective Apple Knowledge		0.860	0.905	0.704
I understand a lot about apples	0.821			
I am confident in my knowledge of apples	0.810			
Among my friends I am the apple expert	0.882			
I know more about apples than others do	0.841			

Both the Fornell–Larker criterion and Heterotrait–Monotrait (HTMT) ratios were utilized to test discriminant validity, with the requirements for discriminant validity being met for all of the variable constructs (see **Table 3**). The square root of each constructs' AVE was found to be higher than its correlation with other constructs. HTMT ratios are all less than 0.90, with the exception of the HTMT ratio between the importance placed on physical apple attributes and the importance placed on commercial apple attributes (1), which is a higher ratio than that which is recommended. However, this does not represent a problem because the two constructs both measure the apple attribute importance, with one construct being intrinsic and the other extrinsic to the product. Additionally, the largest VIF was 1.338 and the average VIF was 1.158, indicating that there were no problems with multicollinearity [31].

Table 3. Scale discriminant validity.

Fornell–Larcker Criterion	Discerning Apple Buyer	Importance of Apple Commercial Attributes	Importance of Apple Physical Attributes	Attitudes towards US Apple Growers	Subjective Apple Knowledge
Discerning Apple Buyer	0.710				
Importance of Apple Commercial Attributes	0.638	0.726			
Importance of Apple Physical Attributes	0.571	0.719	0.737		

Fornell–Larcker Criterion	Discerning Apple Buyer	Importance of Apple Commercial Attributes	Importance of Apple Physical Attributes	Attitudes towards US Apple Growers	Subjective Apple Knowledge
Attitudes towards US Apple Growers	0.503	0.476	0.501	0.743	
Subjective Apple Knowledge	0.484	0.426	0.360	0.548	0.839
Heterotrait–Monotrait Ratio					
Discerning Apple Buyer					
Importance of Apple Commercial Attributes	0.831				
Importance of Apple Physical Attributes	0.713	1			
Attitudes towards US Apple Growers	0.588	0.614	0.618		
Subjective Apple Knowledge	0.566	0.546	0.417	0.635	

The conceptual framework and its overall structure was tested, resulting in a Goodness of Fit of 0.43 and a Normed Fit Index of 0.676. A Standardised Root Mean Square Residual of 0.074 was also achieved, and this indicated that adequacy of the overall model fit. The explanatory and predictive power of the conceptual model was also tested, and this resulted in average R^2/Q^2 values of 0.349/0.293, which indicates that the model has overall weak/moderate explanatory power and moderate predictive relevance. However, some parts of the model were found to be stronger than other parts. The R^2/Q^2 scores of 0.248/0.336 for discerning apple buyers would be considered weak in their explanatory power and moderate in their predictive relevance, but the score of 0.440/0.216 for importance placed on commercial apple attributes, and 0.388/0.247 for importance placed on physical apple attributes indicate weak/moderate levels of explanatory power and small predictive relevance. The score of 0.321/0.372 for attitudes towards US growers would be considered to have moderate explanatory power and medium predictive relevance. The structure of the model was confirmed to be fit for hypothesis testing due to the adequate model fit, the weak to moderate explanatory power, and the weak to medium predictive accuracy. **Table 4** and **Figure 1** show the results of the hypothesis testing.

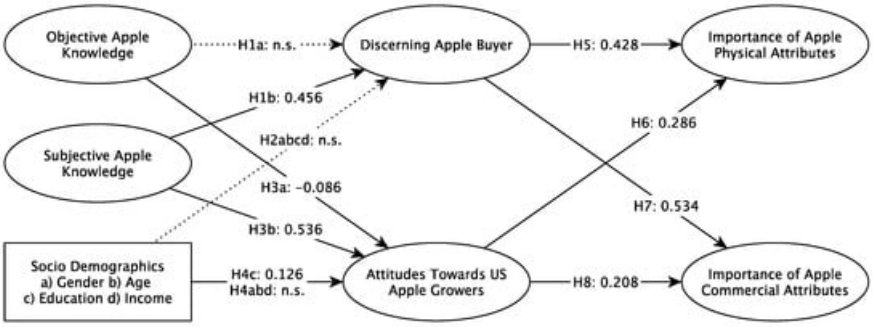

Figure 1. Results of the conceptual model.

Table 4. Path coefficients and hypothesis testing results.

Hypothesised Relationship	Coefficient	T Stat	p Value
H1a: Objective Apple Knowledge -> Discerning Apple Buyer	−0.008	0.191	0.848
H1b: Subjective Apple Knowledge -> Discerning Apple Buyer	**0.456**	11.929	0.000
H2a: Gender -> Discerning Apple Buyer	−0.027	0.627	0.530
H2b: Age -> Discerning Apple Buyer	−0.077	1.773	0.076
H2c: Education -> Discerning Apple Buyer	0.068	1.511	0.131
H2d: Income -> Discerning Apple Buyer	−0.054	1.206	0.228
H3a: Objective Apple Knowledge -> My Attitudes towards US Apple Growers	**−0.086**	2.133	0.033
H3b: Subjective Apple Knowledge -> My Attitudes towards US Apple Growers	**0.536**	10.553	0.000
H4a: Gender -> My Attitudes towards US Apple Growers	−0.006	0.129	0.898
H4b: Age -> My Attitudes towards US Apple Growers	0.031	0.729	0.466
H4c: Education -> My Attitudes towards US Apple Growers	**0.126**	2.134	0.033
H4d: Income -> My Attitudes towards US Apple Growers	0.005	0.140	0.889
H5: Discerning Apple Buyer -> Importance of Apple Physical Attributes	**0.428**	7.142	0.000
H6: My Attitudes towards US Apple Growers -> Importance of Apple Physical Attributes	**0.286**	4.776	0.000
H7: Discerning Apple Buyer -> Importance of Apple Commercial Attributes	**0.534**	9.267	0.000
H8: My Attitudes towards US Apple Growers -> Importance of Apple Commercial Attributes	**0.208**	3.586	0.000

Bold = $p < 0.05$.

The subjective knowledge was the most important factor determining the discernment of buyers and attitudes towards US growers. Objective knowledge was not found to have any impact, while only education as a sociodemographic factor had impact. The discernment as a buyer and the ability to distinguish apple varieties had the greatest impact on the importance that US consumers placed on apple attributes. Additionally, attitudes towards growers impacted the importance consumers placed on intrinsic and extrinsic apple attributes.

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Keywords

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