

The Consumers Characteristics Analysis of Low Temperature Home Delivery

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Abstract: Because of technological advancements and the popularity of the Internet, online shopping has become an important shopping channel for consumers. Because people increasingly eat out, more consumers shop online, and food products are collected from convenience stores, or frozen food home delivery services are used. This study used questionnaire surveys to analyze the consumption habits of residents who shop online for frozen foods in the urban areas of northern Taiwan (Taipei City and New Taipei City). We distributed and collected 548 questionnaires, of which 484 were valid. Descriptive statistics, a chi-square test, and logistics regression analysis were used to analyze consumer characteristics, as well as important influential factors. The research results indicated that most online shoppers were women, and the top 3 factors influencing their purchasing decisions were freshness, delivery convenience, and ordering convenience. Participants in the age group of 40-49 years old, living in the urban area of the New Taipei City, without junior college education, and with less than 10,000 NTD monthly incomes, were less likely to purchase frozen foods using low-temperature logistics services.

Keywords: Consumer characteristics, frozen food, online shopping, home delivery, logistics.

Introduction

As the average income rises in Taiwan, and Internet use become more ubiquitous, the entire social environment and structure is changing, leading to changes in contemporary lifestyles. Advances in technology and globalization have driven consumption rates to higher levels, and as a result people are gradually eating out more. The Otaku economy (stay-at-home-economy) is on the rise. People often find online shopping convenient, because they can receive the goods without leaving home, or they can collect their food purchases from convenience stores in the area. According to data from the Department of Statistics in the Ministry of Economic Affairs [4] between 1997 and 2004 the sales volume of frozen food in Taiwan declined year on year, and only increased again from 2004. By 2011, the production value was approaching 52.8 billion NTD (including non-frozen processed foods), and consumers tended to purchase frozen meat and processed foods. Because of the rise of online shopping, and the rise of the new home-delivery logistics industry, the Taiwanese public is increasingly opting for frozen foods. Online shopping is usually linked with home delivery services that deliver purchases directly to the customer. According to Kuo and Chung [7], home delivery of frozen foods made up 10%-15% of all home food deliveries at the time, and was expected to reach 30-50% with a market value of more than 6 billion NTD in 2010.

This demonstrates the importance of frozen food home deliveries as part of the entire home delivery industry. This study therefore evaluates the low-temperature home delivery industry and its related logistics; to analysis the factors influencing consumers' purchase decision-making, frozen food consumer characteristics, as well as the scale of the home delivery market. The objective of this study is to provide low-temperature logistics companies and online retailers with data on consumer characteristics and demands in this market, to be used as a reference in planning and adjusting operational strategies.

This study evaluated the literature on low-temperature foods, home delivery, and online shopping. Wang [14] explored the delivery routes of low-temperature foods, and demonstrated that because frozen food involves temperature control, mathematical models can be used to address this problem, using time-window restrictions to represent the preservation and sales characteristics of frozen food, as well as generic algorithms to achieve the minimum total transportation costs and maximum customer satisfaction. Guo [5] examined consumer characteristics and online shopping intention for fresh foods in a study on white-collar workers in three metropolitan areas (Taipei, Taichung, and Kaohsiung), and their willingness to purchase fresh food online. The results demonstrated that consumers in Taipei were more willing to buy fresh foods online, and that significant differences existed among areas. Chen [3] studied the frozen processed food industry to explore the relationship between performance and four variables: raw material selection; production and manufacture; delivery; and marketing of frozen food.

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Forty-two Taiwanese frozen processed food businesses were used for the analysis. Chang's [2] study evaluated the effect of new low-temperature foods on market performance by focusing on the acceptance of new products in the market, and conducted in-depth interviews in eight companies. The research results indicated that the introduction of new products was determined by customer-oriented approach, and corporations need to keep promoting new products to maintain the performance of old and new products on the market. Yeh [15] researched the behavior, satisfaction, and loyalty of frozen goods consumers and found that the main customers of frozen foods were in the 20-35 age group, married with children, and had university/college level education, worked as private employees, and had a personal monthly income of 30,000 to 40,000 NTD.

Literature focused on home delivery services includes Lu's [11] analysis of conditions in the Taiwanese home delivery market. That study integrated research opinions in the industry, government, and academia, to establish home delivery service management strategies for home delivery operators to use as a reference in their operational strategies. The research results demonstrated that the three most important management principles were to construct comprehensive delivery network energy, elevate service quality, and strengthen service mechanisms. Strategic plans have to prioritize customer development, but other strategies for service optimization were also found to be essential and need to be integrated to achieve an optimal strategic plan. Lee [9] and Lan [8] investigated service quality and satisfaction in the home delivery business by analyzing productivity and marketing strategies. The study aimed to provide businesses with a basis to adjust marketing strategies with objective and quantitative results when conducting productivity performance indicator analyses. Yu [16] explored the key factors influencing management success in the home delivery industry, using Taiwan Pelican Express as a case study, and conducted in-depth interviews and questionnaire surveys to gather data. The study determined the key factors influencing management success in the home delivery industry by using Aaker's [1] findings, which demonstrated that governments need to implement relevant regulations to enable the construction of comprehensive delivery networks, elevate service quality, strengthen employee training, apply advanced technology, establish comprehensive customer complaint mechanisms, product innovation, and diverse services, and evaluate whether these factors were also keys to success for home delivery businesses in Taiwan. Hu and Wu [6] analyzed the effect of the brand images of home delivery services on consumer purchase intentions. A questionnaire survey based mainly on three

prominent home delivery companies in Taiwan was conducted, and used as a structural equation model to analyze them. The findings indicated that consumer brand image and brand alliance compatibility affect purchase intention, and when customers select home delivery companies, a high degree of brand alliance compatibility can elevate the image of a company's brand.

Shiaw and Chiang [12] explored possible factors affecting online shopping behavior, by interviewing internet users in southern Taiwan, and found that the characteristics that companies exhibited online were the most influential and significant, and product characteristics were more specific, especially online transaction security and procedural convenience provided by online companies. Lin [10] analyzed the effect of convenience stores (both virtual and physical channels) on consumption behavior from the viewpoint of consumers. The results demonstrated that online retail options and the collection of produce at convenience stores have gradually become approved and accepted by consumers. Therefore, if businesses could focus more on transaction security, greater business opportunities could follow. In addition, the results showed that promotional activities can encourage consumers to make use of convenience stores' collection services, and people preferred cash discounts and free logistics services as promotional items.

Methods

Research Methods and Questionnaire Design

To analyze the characteristics of online consumers of low-temperature products, this study used questionnaire surveys as a data collection method. In addition, descriptive statistics, the chi-square test, and logistics regression were used in the analyses. The sampling method was quota sampling in non-probability sampling methods, and sample numbers were therefore planned and based on the populations of age groups in different areas. Furthermore, convenience sampling was used for the surveys.

Questionnaire Design

To analyze the consumer characteristics, this study established six basic hypotheses, and the questionnaire questions were designed based on the data item needed for each basic hypothesis.

- H₁ : Subjects with different characteristics differ in purchase frequency in their use of low-temperature logistics to buy frozen food.
- H₂ : Subjects with different characteristics differ in mean purchase amount in their use of low-temperature logistics to buy frozen food.

- H₃ : Subjects with different characteristics differ in the purchase experience in their use of low-temperature logistics to buy frozen food.
- H₄ : Subjects with different characteristics differ in purchase channels in their use of low-temperature logistics to buy frozen food.
- H₅ : Subjects with different characteristics differ in delivery methods in their use of low-temperature logistics to buy frozen food.
- H₆ : Subjects with different characteristics differ in payment methods in their use of low-temperature logistics to buy frozen food.

Based on these six hypotheses, the questionnaire was divided into three portions. The first section focused on frozen food purchases, the second, on experiences using low-temperature logistics services, and the third included basic data. To ensure that the questionnaire content was suitable and easy to understand, it's not only used expert validity evaluation, but also trials to ensure that the question content was clearly explained and easy to understand. After two trials and content adjustments, the questionnaire content was verified for the official survey.

Consumers in metropolitan Taipei have significantly greater purchase intention than consumers in other metropolitan areas. Taipei City and New Taipei City were therefore selected as the areas to be surveyed. We distributed 300 questionnaires, and ensured that the sample size conformed to the population. The demographic ratios of different genders and ages at the end of 2011 in Taipei County was therefore used for non-probabilistic quota sampling to compute the number of samples that had to be extracted from each age group, and the groups with fewer than 30 questionnaires were adjusted to 30 questionnaires. Table 1 demonstrates that this study distributed 382 questionnaires, approximately 30-37 questionnaires for each age level.

Results and Discussion

In December 2012, surveyors performed visits to conduct the questionnaire survey, and retrieved a total of 548 questionnaires, with 484 valid questionnaires, constituting a valid retrieval rate of 88.32%. The age group distribution of the valid questionnaires conformed to the planned distribution ratio, as indicated in Figures 1 and 2.

Descriptive Statistics

Basic Data

Approximately half of the participants were from New Taipei City, and the other half from Taipei City

(57% and 43%). In terms of gender, the sample group had slightly more women (54%). More participants were married (57%) than unmarried. Fifty-five percent had children, and 38% had high school or vocational school as their education level. Thirty-eight percent of the participants were working in commerce/services. Forty-one percent had a mean monthly income in the 20,001-40,000 NTD bracket. Most had Internet experience, and time spent online each week was less than 3.5 hours. Forty-seven percent of participants had online shopping experience (Table 2).

Frozen Food Purchase

The analytical results demonstrated that 135 participants had used low-temperature logistics services to purchase frozen food (28%), and 349 had never used them. Among the non-users, the main reasons for not using low-temperature logistics services to purchase frozen food included the inability to see the physical product, quality concerns, and concerns about food storage and hygiene.

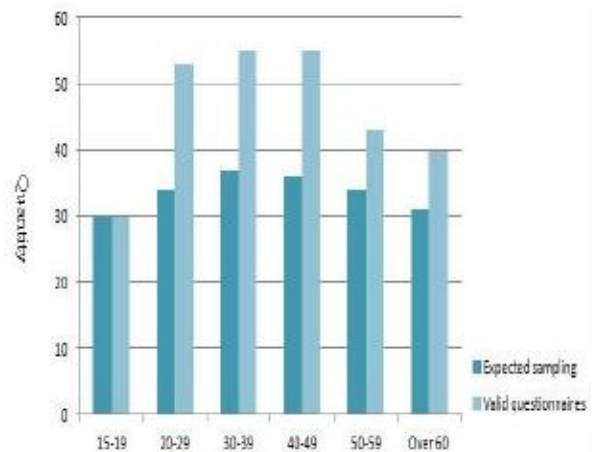


Figure 1. Comparison of New Taipei City questionnaires

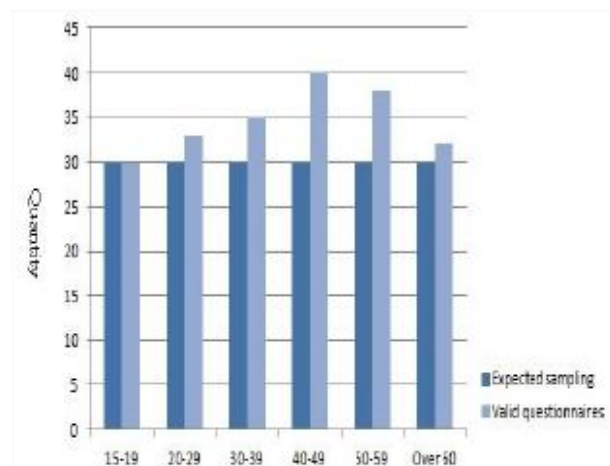


Figure 2. Comparison of Taipei City Questionnaires

Table 1. Plan for sample questionnaire numbers

Age	New Taipei City			Taipei City		
	Numbers (note)	Ratio (%)	Projected	Numbers (note)	Ratio (%)	Projected
15-19	269,741	0.05	30	159,484	0.03	30
20-29	595,867	0.11	34	331,131	0.06	30
30-39	695,055	0.12	37	427,287	0.07	30
40-49	649,819	0.12	36	432,506	0.08	30
50-59	606,550	0.11	34	419,719	0.08	30
Over 60	532,076	0.09	31	497,875	0.08	30
Total	3,349,108	0.60	202	2,268,002	0.40	180

Note : The numbers of people in different age groups are based on Directorate General of Budget, Accounting and Statistics, Executive Yuan 201

Source: Directorate General of Budget, Accounting and Statistics, Executive Yuan

Table 2. Basic data of subjects

Demographic variable	Type	Frequency	Ratio (%)	Demographic variable	Type	Frequency	Ratio (%)
Gender	Male	224	46	Education	Elementary school or less	50	10
	Female	260	54		Junior high school	48	10
Age	15-19 years	60	12		High (vocational) school	185	38
	20-29 years	158	33		Junior college and university	183	38
	30-39 years	148	31		Graduate school and over	18	4
	40-49 years	86	18		Industry/manufacturing	59	12
	50-59 years	20	4		Commerce/service	184	38
	60 years and over	12	2		Agriculture, forestry, fishery, livestock	5	1
Place of residence	Taipei city	208	43		Self-employed	32	7
	Taipei County metropolitan area	255	53		Occupation	Military, public servant, education	20
	Taipei County suburban area	21	4	Home-maker		53	11
Time spent online each week	Does not use the internet	131	27	Retired		35	7
	Under 3.5 hours	103	21	Student		70	15
	Over 3.5 hours-under 7 hours	91	19	None		20	4
	Over 7 hours-under 14 hours	67	13	Other		6	1
	More than 14 hours – under 21 hours	46	10	Mean personal monthly income	10,000 NTD or below	113	23
	More than 21 hours	46	10		10,001-20,000 NTD	82	17
Whether one has online shopping experience	Yes	226	47		20,001-40,000 NTD	200	40
	No	258	53		40,001-60,000 NTD	71	15
Marital status	Married	274	57	Children	60,001 or more	18	4
	Unmarried	210	43		None	220	45
					Yes	264	55

Most consumers purchased from supermarkets, followed by volume stores, and convenience stores. On average, the most frequently purchased frozen foods were ice-type foods, at 17%, followed by flour-based foods such as dumplings and green onion pancakes (15%), followed by ball-type foods such as

fish balls and meat balls (12%). The highest purchase frequency was one month (40%), and the mean purchase amount for most was below 500 NTD (44%). The three main motives for buying frozen food were purchasing convenience, convenient and quick preparation, and longer preservation (Table 3).

Table 3. Compilation of buying through low-temperature logistics

Item	Type	Freq	Ratio (%)	Item	Type	Freq	Rank	
Whether low-temperature logistics is used	Yes	135	28	Reasons for not using low-temperature logistics (multiple)	Cannot see physical products	1427	1	
	No	349	72		Concern about poor quality	1238	2	
Ratio of purchase frequency and amount --purchase frequency	One month	192	39		Concern about food storage and hygiene	1055	3	
	Two weeks	114	23		Payment security	1050	4	
	Three months	88	19		Does not want to change purchasing habits	807	5	
	One week	52	11		Complex/inconvenient ordering procedures	637	6	
	Six months	28	6		Other	19	7	
	One year	2	0	Supermarket Volume stores/wholesale stores	3002	1		
	Over one year	8	2	Convenience stores	2885	2		
Ratio of purchase frequency and amount -mean purchase amount	Less than 500 NTD	212	44	Channels for buying low-temperature foods (multiple)	Traditional stores/small stores	2442	3	
	501-1,001 NTD	179	37		Military, public servant, education benefit centers	728	4	
	1,001-2,000 NTD	76	16		Online shopping	713	5	
	2,001-3,000 NTD	13	3		Television shopping	176	6	
	More than 3,001 NTD	4	0		Other	117	7	
						30	8	
Item	Type	Freq	Rank		Item	Type	Freq	Rank
Types of low-temperature foods purchased (multiple)	Ice	245	1		Ratios of purchase motive (multiple)	Convenient and fast cooking	281	1
	Flour	214	2	Can be preserved longer		217	2	
	Fried Balls	173	3	Convenient purchasing		324	3	
	Frozen cuisines	176	4	Many flavors to choose from		148	4	
	Meats	149	6	Price is cheap		100	5	
		Oden	104	7		Test tastes	31	6
		Rice products	90	8		Food nutrition	5	7
		Frozen fruits and vegetables	65	9		Other	3	8
		Medicinal cuisines	39	10				
		New Year's dishes	32	11				

Note: reasons for not using low-temperature logistics (multiple), channels for buying low-temperature foods (multiple) are ranked 1, 2, 3,....., the first place ranking has 3 points, second place has 2 points.....and so on.

Experiences with Low-temperature Logistics Services

Among the 484 valid questionnaires, 135 indicated experience with low-temperature logistics services. The analysis demonstrated that more participants ordered frozen food with convenience stores as the purchasing channel (46%), and the mean amount spent was 501-1000 NTD (49%). The highest purchasing frequency was one month (30%).

Most selected home delivery as delivery method (70%), and most selected cash on delivery as payment method (58%). Twenty-eight percent of participants received the relevant information from television commercials. The top three factors influencing purchases were freshness, expiration date, and service quality. Participants indicated that freshness was the main consideration in using low-temperature logistics services, followed by ease of goods acquisition, and ease of goods ordering (Table 4).

Table 4. Low-temperature logistics consumption characteristics

Item	Type	Frequency	Ratio (%)	Item	Type	Frequency	Ratio (%)
Purchase channels	Convenience store ordering	62	46	Frequency for buying frozen food	One month	40	29
	Online shopping	44	32		Six months	35	26
	Television shopping	17	13		Three months	34	25
	Mail order	9	7		More than one year	8	6
	Other	4	2		Two weeks	7	5
Mean amount spent on frozen food	501-1,000 NTD	67	49		One year	6	4
	1,001-2,000 NTD	33	24		One week	6	4
	Under 500 NTD	30	22	Delivery methods for purchased frozen food	Home delivery	94	69
	2,001-3,000 NTD	4	3		Pick-up at store	40	29
	More than 3,001 NTD	2	2		Other	2	1
	Payment methods for purchased frozen food	Cash on delivery	79		58	Sources of finding out about frozen food	Television commercial
Credit card		25	18	Heard from others	64		27
ATM transfer		19	14	Webpage recommendation	60		25
Postal transfer		11	8	Newspapers and magazines	42		17
Other		2	2	Company website	8		3
Item	Type	Frequency	Ranking	Item	Type		Frequency
Reasons for using low-temperature logistics to purchase frozen food	Freshness	523	1	Factors for using low-temperature logistics to buy low-temperature foods	Freshness	742	1
	Ease in acquiring goods	495	2		Expiration date	610	2
	Ease in ordering goods	382	3		Service quality	415	3
	Expiration date	314	4		Ease in acquiring goods	331	4
	Payment choice	288	5		Ease in ordering goods	313	5
	Designated time	282	6		Price	283	6
	Service quality	272	7		Payment choice	228	7
	Price	254	8		Time-efficiency	121	8
	Time-efficiency	176	9		Designated time	81	9
	Evening delivery	129	10		Delivery tracking	65	10
	Delivery tracking	109	11		Evening delivery	40	11

Chi-square Test

To understand whether subject characteristics affect frozen food purchases, a crossover analysis and chi-square test were performed to determine the consumers' purchase characteristics and personal traits. Table 5 demonstrates that among the 60 groups of chi-square tests, 23 groups showed significant differences.

The analytical results of the chi-square tests were used to formulate the study's basic hypotheses, as follows:

H1: Participants with different characteristics used low-temperature logistics services to buy frozen food at different frequencies.

Evaluation results: partially established.

Explanation: Only significant variance in age, education, and time spent online existed, the other variables did not demonstrate significant variance. Consumers 20-29 years old had a high purchasing frequency, and participants with high (vocational) school education levels had a higher purchasing frequency. Participants who spent less than 3.5 hours online demonstrated higher purchasing frequency.

H2: Participants with different characteristics differ in the mean purchase amount spent buying frozen food from low-temperature logistics companies.

Evaluation results: partially established.

Explanation: Only occupation and monthly personal

Table 5. Chi-square test chart

Variable	Purchase frequency	Mean purchase amount	Whether one has experience using low-temperature logistics	Experience using low-temperature logistics		
				Which type of channel used	How goods are acquired	Payment methods
Gender	0.131	0.585	0.003*	0.853	0.462	0.474
Age	0.042*	0.171	0.000*	0.009*	0.255	0.001*
Residence	0.447	0.197	0.030*	0.172	0.795	0.312
Education	0.007*	0.729	0.000*	0.279	0.001*	0.244
Occupation	0.138	0.000*	0.015*	0.201	0.631	0.909
Marital status	0.437	0.128	0.033*	0.064	0.686	0.073
Whether there are children	0.541	0.088	0.018*	0.060	0.848	0.075
Personal monthly income	0.302	0.003*	0.000*	0.716	0.200	0.131
Time spent online	0.004*	0.068	0.000*	0.074	0.032*	0.006*
Online shopping	0.109	0.856	0.000*	0.001*	0.002*	0.008*

Note: * denotes significant difference

Table 6. Binary logistic regression model coefficient calibration results

	β	S.E.	Wald	Degrees of freedom	Significance	Exp(β)
40-49 years of age	-0.761	0.301	6.402	1	0.011	0.467
New Taipei City (urban area)	-0.976	0.256	14.544	1	0.000	0.377
high (vocational) school	-1.024	0.275	13.878	1	0.000	0.359
junior college and university	-1.815	0.306	35.069	1	0.000	0.163
10,000 and under	-2.172	0.365	35.456	1	0.000	0.114
does not use the internet	-0.958	0.302	10.028	1	0.002	0.384
has online shopping experience	2.337	0.300	60.562	1	0.000	10.350

income demonstrated significant differences, the other variables did not show significant differences. Among participants with commerce/service occupations, the mean purchase amount was higher. Participants with monthly personal income of 20,001-40,000 NTD had higher mean purchase amounts.

H₃: Participants with different characteristics differ in frozen food purchase experiences with low-temperature logistics companies.

Evaluation results: fully established.

Explanation: The chi-square test results indicated significant trait differences. More customers were women, and most people in the 20-29 age group had online purchasing experience. Most were residents of the New Taipei City, and most participants with high (vocational) school education levels had online purchasing experience. Participants with commerce/service occupations had more purchasing experience, as well as married participants and participants with children. Participants with monthly personal income of 20,001-40,000 NTD had online purchasing experience, and most spent less than 3.5 hours a week online.

H₄: Participants with different characteristics used different purchasing channels to buy frozen food from low-temperature logistics companies.

Evaluation results: partially established.

Explanation: The test results only demonstrated significant age differences in an online shopping experience, and no significant differences were evident in the other variables. Participants in the 20-29 age group used online shopping more frequently to order frozen food, and participants in the 30-39 age group ordered through convenience stores more frequently.

H₅: Participants with different characteristics selected different delivery methods for their frozen food purchases from low-temperature logistics companies.

Evaluation results: partially established.

Explanation: The test results only revealed significant differences in education, time spent online, and online shopping experience, and no significant differences existed in the other variables. Participants with elementary school or lower educational levels more frequently used to store deliveries, and participants with elementary school and higher educational levels tended to use home delivery. Participants who did not use the internet or spent more than 21 hours a week online used store deliveries more regularly. More than 70% of participants with online shopping experience used home delivery, and participants without online shopping experience were split between home delivery and store collection.

H₆: Participants with different characteristics used different payment methods to buy frozen food from low-temperature logistics companies.

Evaluation results: partially established.
 Explanation: The test results demonstrated three significant differences (age, time spent online, and online shopping) and the other variables demonstrated no significant differences. More than half of the participants used cash on delivery as payment method. However, participants in the 15-19 age groups who used the internet for 3.5-7 hours a week were more likely to use the cash on delivery payment method than participants who used the internet for 14-21 hours a week, reaching 70%. Other payment methods used were credit cards and ATMs, and participants without online shopping experience primarily paid by postal transfer.

Logistic Regression

To analyze the crucial factors that influence consumers use low-temperature logistics companies to purchase frozen food, this study used a binary logistic regression model to establish a predictive model for usage intentions.

Basic Variables

After integrating the questionnaire results, frozen food purchasing experience using low-temperature logistics companies was used as the dependent variable, and the socioeconomic and internet usage traits of participants as independent variables. The independent variables included the following: (1) The socioeconomic traits of the participants were gender, age, occupation, place of residence, education, occupation, marital status, number of children, and monthly income. (2) The Internet usage traits of the participants were time spent online each week, and whether a subject had online shopping experience.

Results of Model Construction

We constructed a binary logistic regression model using forward stepwise regression, and the coefficient calibration results are demonstrated in Table 6. Table 6 indicates that the main variables that affect low-temperature logistics companies included age, place of residence, education, monthly income, whether participants had online shopping experience, and time spent online each week.

Influence of Personal Socioeconomic Conditions

Participants aged 40-49 had the lower purchasing intention than participants over 60 years old. Participants aged 40-49 years old were 0.467 times more likely to use low-temperature logistics companies to

Table 7. Nagelkerke R square values

-2 log likelihood	Cox & Snell R square	Nagelkerke R square
435.859	0.385	0.513

Table 8. Model prediction accuracy rate

Variable	Prediction			Percentage modification
	Whether one has the experience of using low-temperature logistics			
	No	Yes		
Whether one has the experience of using low-temperature logistics	No	304	45	87.1
	Yes	51	84	62.2
Percentage	80.2			

buy frozen food than participants who were over 60. Participants who were residents of the New Taipei City metropolitan area had lower purchase intention than participants residing in the suburbs of the New Taipei City. Residents of New Taipei City metropolitan areas were 0.377 times more likely than participants living in the suburbs to buy frozen food from low-temperature logistics companies. Participants with high (vocational) school, junior college, and university educational levels had lower purchasing intention than participants who attended graduate school and higher. Participants with education levels of high (vocational) school and junior college and university were 0.359 and 0.163 times more likely than participants who attended graduate school and over to buy frozen food from low-temperature logistics companies. Participants with monthly income levels below 10,000 NTD had lower purchasing intention than participants with monthly income levels of 60,000 NTD and above. Participants with monthly income levels of less than 10,000 NTD were 0.114 times more likely to use buy frozen food from low-temperature logistics companies than participants with monthly income levels of 60,000 NTD and more.

Influence of Internet Usage Traits

Participants with online shopping experience had greater purchasing intention than those without. Participants with online shopping experience were 10.350 times more likely than those without to buy frozen food from low-temperature logistics companies. The "time spent online" results indicated that fewer participants did not use the Internet at all compared to participants who used it longer than 21 hours a week. Participants who did not use the Internet were 0.384 times more likely to buy frozen food from low-temperature logistics companies than participants who spent more than 21 hours online.

The Nagelkerke R² (Table 7) value in the regression model was 0.513, which indicated that the model

results were acceptable, but not outstanding. However, the predictive accuracy of this model reached 80.2%, which indicated that this model has considerable predictive ability (Table 8).

Conclusions

The purpose of this study was to explore the characteristics of consumers who used online shopping to purchase frozen food products, and stratified sampling and interview questionnaires were used to collect data. Participants were 15 years and older and were residents of Taipei City and New Taipei City. Five hundred and eighty four questionnaires were distributed, and 484 valid questionnaires were returned, demonstrating a valid questionnaire retrieval rate of 88.32%.

The analytical results indicated that purchase motive, types of products purchased, purchase frequency, purchase experience, purchase channels, delivery methods, and payment methods all partially influenced how consumers buy frozen foods through low-temperature logistics companies. Most consumers that shopped online for frozen products worked in the commerce or service industries and were in the 20 to 49 age group, and a greater proportion of participants were women.

One-third of the participants had experience buying frozen foods through low-temperature logistics companies. These purchases were primarily influenced by the freshness, ease of acquiring goods, and ease of ordering goods considerations.

The scope of this research was limited to Taipei City and New Taipei City, and future research can focus on online consumer characteristics in different geographic locations, consumer characteristics in different industries, and whether consumer characteristics vary by location.

The results of this study demonstrated that two-thirds of participants currently do not use online shopping to buy frozen food, and the main reasons were because they could not see the actual product, and they had food quality, storage, hygiene, and transaction security concerns. Therefore, it is suggested that companies selling frozen products online should focus on how to provide consumers with channels to experience the physical products, provide quality assurances, and implement more secure transaction methods.

Participants who purchased frozen food through low-temperature logistics companies placed the greatest importance on freshness. Therefore, temperature control was critical to delivery logistics. It is sug-

gested that logistics and delivery businesses should improve temperature controls, and online shopping vendors should also select logistics and delivery businesses that adequately control product temperatures to maintain optimal product quality.

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