

ONLINE PRODUCT INFORMATION CHARACTERISTICS EFFECT ON PRODUCT INFORMATION SHARING IN THAILAND

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Abstract

Based on a review of previous studies, a model of online product information characteristics' effects on consumers' product information sharing behaviors was formulated, analyzed and developed using data collected through a self-administered questionnaire from a target sample of 400 consumers. The characteristics of online product information are represented by three constructs (product information visualization, interactivity, and credibility), which influence consumer cognitive behaviors related to perceived fluency, perceived usefulness and in turn product information sharing. Many of the findings that relate to the direct effects of the variables in previous studies were confirmed. However, there were new findings that relate to the significant direct, indirect and total effects of product information visualization, interactivity and credibility on product information sharing with the use of Structural Equation Modeling (SEM). Apart from the theoretical contribution of the study, specifically the inclusion of the indirect and total effects, practical implications were also noted. These are discussed with the objectives of improving online product quality and visibility that would have positive consequences for consumer cognitive behaviors and especially for product information influence expansion. Importantly, the study addresses the limited number of previous studies conducted with regard to consumers' behaviors in current online environments.

Keywords: Online product information characteristics; Stimulation-organism-model; Technology acceptance model; Perceived fluency; Product information sharing



Introduction

The development of online purchasing platform with the support of the latest information technology system is creating many opportunities for enterprises to attract and service customers by using several information resources. These new characteristics of online product information cater to the diversified information demands of the consumers, who would like to access useful product information resources that will aid them in evaluating the value of product as well as in realizing their emotional closeness with the goods. Although many enterprises have invested in online sales process, many of them are not fully aware of the characteristics of online product information thus, there is this urgent need for these enterprises to develop strategies that will enhance their competitive advantage over others, and have positive influence on consumer's product information cognitive behaviors. Thus, the purpose of this present study is to examine the characteristics of online product information that affect

consumer's product information sharing behaviors in Thailand.

This present study holds the distinction to be one of the few studies that explore online product information for enterprises and consumers. The findings will theoretically be relevant as it did not only investigate direct effects but indirect and total effects as well. Practicality-wise, the findings of this present study are taken from its theoretical findings.

Related literature and model constructs

Overview of previous studies

Table 1 presents the findings of the previous studies related to online product information characteristics and consumer's product information cognitive behaviors especially in terms of the information sharing behavior of consumers in online marketing environments. This overview focuses on studies that used quantitative and qualitative methods to evaluate theoretical causal models.

Table 1 The overview of related studies

Theory	Behavior Examined	Focus of Study	Constructs Studied
Stimulation-Organism-Response Model Reference	To explore the consumer purchasing response Belk, (1975)	Investigation of how products stimulate consumers to respond.	Situation, Product, Consumer, Behavior
Technology Acceptance Model Reference	To explain the individual's technology acceptance behavior Davis, (1989)	To focus on the individual's usage behavior of technology with the concept of cognitive behavior.	External Environment, Perceived Usefulness, Perceived Ease of Use, Usage Behavior
Information Quality Reference	Assessment of the quality of healthcare information Kahn et al., (2002)	How to organize, develop and deliver information products or services.	Information Product or Service: Conformance, Consumer Expectations, Useful, and Dependable
Information Use Environments Theory Reference	It is critical to understand the search process as this will affect how the value of information is determined. Taylor, (1991)	It is the set of elements that affects the flow and use of information messages and determines the criteria by which the value of information messages will be judged.	Sets of people, typical structure and thrust of problems of those sets of people, typical settings, and what constitutes resolution of problems
Information Retrieval Behavior Reference	Web Search Behavior Hsieh-Yee, (2001)	Study behavior at the micro-level where users interact with information to perform tasks.	Information, organizations, and presentation; Types of search task; Web experience; Cognitive abilities; Affective states; and Interaction
Dual Coding Theory Reference	Exploring information processing ability in human mind aids learning. Paivio, A., (2007).	To explain human behavior and experience in terms of dynamic associative processes that operate on a rich network of modality-specific verbal and nonverbal representations.	Visual and verbal information, Different information channels in human mind, creating separate representations for information processing
Information Structure Reference	To present how the information is formally packaged within a sentence Krifka, M., (2008)	It focuses on the linguistic and pragmatic description of information structure within a sentence.	Focus and Background, Topic and Comment, Given and News
Information Grounds Theory Reference	To explore how nurses, the elderly and other individuals share human healthcare information services. Pettigrew, K.E., & Mckechnie, L., (2001)	To identify the synergistic environments temporarily created by the people who group together for a singular purpose but from whose behavior emerges a social atmosphere that fosters the spontaneous and serendipitous sharing of information.	Physical environment, Clinic's activities, Nurse's situation, Patient's condition, and Information sharing
Social Networking Information Ecosystem Reference	Information Sharing Zhang Xiangxian et al., (2014)	Information sharing between subjects in the network, and a chain of dependency	Information consumer and producer, question, and answer interaction.



Model constructs

Based on the overview presented in Table 1, it was deemed appropriate to develop a theoretical model based on an extension of the Stimulation-Organism-Response Model and Technology Acceptance Model using six behavioral constructs organized into two groups (the characteristics of online product information and consumer's product information cognitive behavior). The said constructs were identified in previous studies as having important relationships with consumer's product information sharing behavior in online environments.

Three constructs represent Online Product Information Characteristics:

Product Information Visualization: Information visualization reflects visual representations (or interaction techniques) of abstract information to reinforce human cognition, which allow users to see, explore and understand large amounts of information at once, which is a creation approached for conveying numerical and non-numerical data in intuitive ways (Thomas & Cook, 2006; Munzner, 2008). So, product information visualization means visualization technology is put into use in non-spatial data domain, which is the process of online product information transforming through picture processing, user interface, computer vision, computer modeling and so on (Bederson & Shneiderman, 2003). Furthermore, related product information content and attribute are transformed in creating visual forms by taking on "three-dimensional" and "visualization" perspectives (Sadiku et al., 2016). The information is presented in a most intuitive approach, which could motivate

consumers to intuitively discover the product information content and potential features, relationships and patterns, and then quickly understand the related abstraction of product information descriptions (Conati, et al., 2015).

Product Information Interactivity: Generally, interactivity is specific to information exchange through online media, which relates to the concepts of user control, active control, synchronicity, timeliness, bidirectionality and responsiveness (McMillan & Hwang, 2002; Liu & Shrum, 2002; Yadav & Varadarajan, 2005; Rafaeli & Ariel, 2007). Consequently, interactivity is considered applicable to online product information as it describes the capability of the consumer to use online media to communicate with the manufacturer (or other clients who are interested in those related products;) and access hypermedia content (Hoffman & Novak, 1996; Newhagen, 2004). Adopting this phenomenon, increasing levels of product information interactivity may allow consumers who are using an online shopping environment to gain greater controlling experience of purchasing in the shortest possible time, which is consequently associated with increased cognitive experience (Defleaur, 2017). Furthermore, increased levels of product information interactivity in an online shopping environment are expected to have a positive relationship with an individual's cognitive experience and behavior (Fiore et al., 2005; Paul, 2005).

Product Information Credibility: Information credibility indicates the extent to which one perceives information to be acceptable, which also



generates a sense of trust and compliance, and mainly use a certain prestige from information subject to forecasts the information user's further actions (Deimen, et al., 2015; McKnight & Kacmar, 2006, Harris et al., 2011). There are two clues that present information user's acceptance behavior towards the information: (1) the central clue requires lots of diligent consideration of information factors such as information content, information source and argument strength of information; and (2) the peripheral clue, which is a consideration with less cognition performance but focuses on information—irrelevant factors that influence information user to access the information such as information channel and information ground factors (Pettigrew, 1999; Vieira, 2014). The effects of central and peripheral factors on people's perception of information credibility can be shifted by the information user's motivation and ability (Petty et al., 1987). So, when the consumer has high level of ability to evaluate the online product information credibility, he or she would like to take the central route that considers product information content very carefully. Also, the qualified product information can produce a sense of trust and dependence for the consumers when the arguments of product information ground are not sufficient (Chaiken & Masheswaren, 1994). Furthermore, the consumer would like to do product information producing and understanding based on the related clues if information source is in a climate of high professionalism (Petty et al., 1983). In addition, the consumer will take peripheral clue that put effort to evaluate medium that provides product information if he or she has minor level

of ability to evaluate product information credibility. Specifically, the product information channel with better reliability and validity can make the information users believe the clues with less doubts (Reinhard et al., 2011; Cosenza et al., 2015).

On the other hand, three constructs represent Consumer's Product Information Cognitive Behavior:

Perceived Fluency: Perceived fluency consists of the difficulty levels of perception and experience about information transaction course in which the individual can make use of the characteristics of information surface properties. The subjective experience of information transaction also influences the weight assignment and degree of attention to different information scents during information transaction course (Claypool et al., 2015; Deckert, 2015). Generally, the information scent with a high perceived fluency value will produce high weight assignment and degree of attention to information transaction comparing with the information scent with low perceived fluency value (Shah & Oppenheimer, 2007). There are two functions for information transaction course: (a) analytic processing, which is the process of information analysis and cognition from the greatest possible consideration; and (b) heuristic processing, which is the shallow parsing and cognition for information transaction with less attention and cognitive resources. Perceived fluency has a direct impact on information user's cognition through the characteristic of information surface features, which also motivates information user to accept different information transaction methods that



indirectly affect information user's cognition process (Alter et al., 2007). Furthermore, high perceived fluency always encourages related information user to select heuristic processing for information transaction and cognition. On the contrary, analytic processing will be selected if the information caricaturists cause low perceived fluency (Shah, Oppenheimer, 2008). Therefore, information fluency is the ability to unconsciously interpret product information in all possible forms in order to extract related essential knowledge, meaning and significance, which is used to complete purchasing tasks and problems effectively in the real-world.

Perceived Usefulness: Generally, people would like to evaluate the results of their behaviors and these behaviors are based on the degree to which they believe the actions that they chose would enhance their expectation value. This then indicates that perceived usefulness is the most important factor affecting people's acceptance behavior (Davis, 1989; Mathieson et al., 2001; Venkatesh et al., 2012). So, the high perceived usefulness to online product information environment means the strong positive usage performance (Davis, 1989). Also, perceived usefulness was not only defined as online product information usage behavior leading to enhancement in online purchasing consequences, but it also refers to making purchasing decision easier and more satisfying, which reduces purchasing costs as well as improve quality of online product information (Venkatesh et al., 2003; Shekelle et al., 2006).

Product Information Sharing: Information sharing is a kind of essential behavioral expression that creates a

mechanism for coordination and integration of the processes or activities along information flow (Lee & Whang, 2000; Pujara & Kant, 2015). Information sharing relates to the activities of distributing useful information among people, system or the unit in an open environment, which address "what to share," "how to share," and "when to share," which could minimize information cost, information deficiency or overload and improve information responsiveness (Sun & Yen, 2005). This could help manufacturers to gain competitive advantage and ensure product availability in online flagship platform as this is largely being influenced by how related product information is in the current online communication platform (Mason-Jones & Towill, 1998; Ramayah & Omar, 2010). Besides, in order to ensure that the consumer's online product information requirement can be fulfilled, product information sharing is fundamental to manage the online product information flow associated with the movement of product information to another interested customers (Singh, 1996). Furthermore, effective online product information flow is dependent on information sharing among its customer group (Lee et al., 1997). The manufacturer would be able to respond effectively to the changing of market demand requirements through information sharing (Daugherty et al., 1995; Mason-Jones & Towill, 1997).

Theoretical model

The theoretical model in Figure 1 is notated to indicate the eight research hypotheses associated with direct causal effects. There are two groups of variables representing the characteristics of online

product information and consumer's product information cognitive behavior. The variables that represent the characteristics of online product information are exogenous, two of the three consumer's product information

cognitive behavior variables are endogenous intervening (mediating) variables and the three (product information sharing) is the endogenous dependent variable.

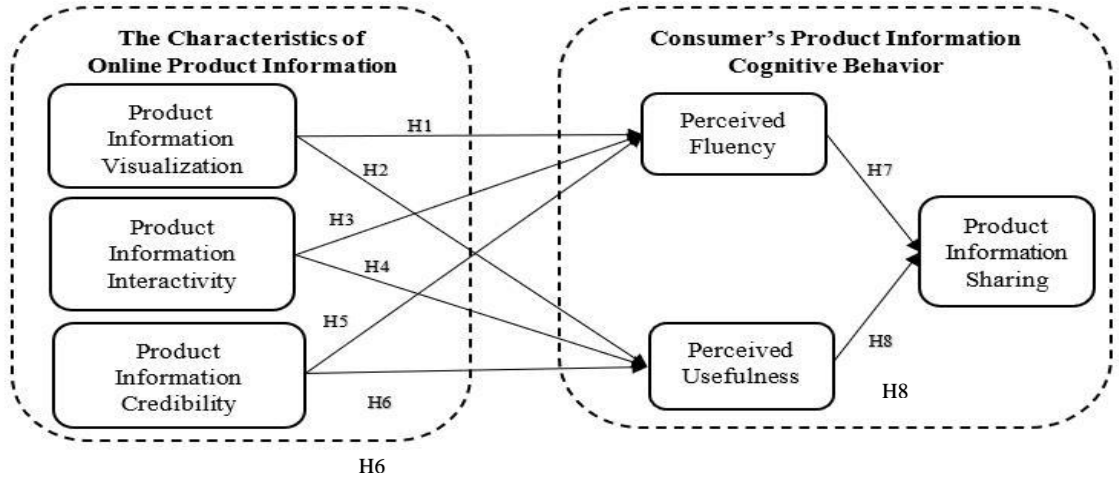


Figure 1 Theoretical model

The eight hypotheses associated with the direct effects in Figure 1 are stated in Table 2 which includes references that

motivated the formulation of the hypotheses.

Table 2 Research hypotheses for direct effects

No.	Research Hypothesis
H1	Product Information Visualization has a significant positive influence on Perceived Fluency
H2	Product Information Visualization has a significant positive influence on Perceived Usefulness
H3	Product Information Interactivity has a significant positive influence on Perceived Fluency
H4	Product Information Interactivity has a significant positive influence on Perceived Usefulness
H5	Product information Credibility has a significant positive influence on Perceived Fluency
H6	Product information Credibility has a significant positive influence on Perceived Usefulness
H7	Perceived Fluency has a significant positive influence on Product Information Sharing
H8	Perceived Usefulness has a significant positive influence on Product Information Sharing

However, it should be noted that there is no research hypothesis in Table 2 that concerns indirect effects, which is considered as the limitation of this present research. For further understanding, the Structural Equation Modeling (SEM) analysis was used to analyze, report and identify whether

there are any significant mediation effects existing among the studied variables.

Table 3 shows the labels for the indicators, which were measured on five-point Likert scales and treated as interval scale measures.

Table 3 Definitions and measurement of model variables

Variable (Indicators)	Definition
	The extent to which:
Product Information Visualization (PV1-5)	Online product information provided by the enterprise is: attractive, reliable, accurate, comprehensive, and guides influence consumer’s perception about its product
Product Information Interaction (PI1-5)	The enterprise understands consumer needs and answers purchasing questions from consumers appropriately. And the online product information is helpful for the consumer to understand product features and attributes, make purchasing decision.
Product Information Credibility (PC1-5)	Online product information provided by the enterprise is believable, suggestive, instructive, attributive, and an important stimulus for product cognitive activities.
Perceived Fluency (PF1-4)	The activity of using the enterprise’s online information behavior is perceived to be simplicity, flexibility, detailed, and apart from any anticipated product performance consequences.
Perceived Usefulness (PU1-5)	Online product information provided by the enterprise is: valuable, easy, satisfying, and qualified for the consumer to maintain their attentions.
Product Information Sharing (PS1-6)	Overall, the enterprise and consumer expectations are satisfied by the performance of its online product information.

Data preparation and descriptive analyses

This section presents the results of analyses. The discussion of these results is addressed in the next section.

Data preparation

A cross-sectional field study was used to collect the data with a self-administered questionnaire in Thai version, which was designed to measure the personal characteristics of the respondents and

variables in the theoretical model. Thai version of the questionnaire was prepared and reviewed by a focus group of five experts. Suggested modifications concerned mainly with language expression, different knowledge background and sociocultural background, which were then included in the revised versions of the questionnaire. A pilot study was conducted with a sample of 10 suitable respondents in order to make sure there is no further modifications required in the full study.

The subjects were individuals in

Thailand who had online purchasing experience. In Thailand, the size of this population certainly exceeds 100,000. Consequently, with 5% precision and a 95% confidence level a minimum sample size of 400 was determined which satisfied the criteria for the statistical validity of this present study (Kline, 2016). Since no reliable sampling frame was available, a purposive sampling method was used. Questionnaires were distributed to members of the target population using online platforms to direct participants to the questionnaire.

Data from 561 questionnaires were entered into an SPSS worksheet and a random selection of 10 percent (56) was checked for accuracy of data entry. No errors were found and none of the questionnaires included missing values or an outlier measure for any of the indicators for the latent variables.

Principal Component factor analysis was used to examine the construct validity of the latent variables. This required indicators to load onto only the latent variable that they were proposed to measure with a factor loading of at least 0.4 in magnitude and an associated eigenvalue of at least 1 (Straub & Gefen, 2004). The equivalence reliability of the sets of indicators was assessed using Cronbach alpha coefficients. The satisfactory results for construct validity and equivalence reliability are shown as part of Table 5.

Participants and model variables

Descriptive statistics for the distributions of the personal characteristics of the 561 participants are summarized in Table 4.

Table 4 Descriptive statistics for personal characteristics

Characteristic	Descriptive Statistics
Gender	302 males (53.8%) and 259 females (46.2%)
Age (Years)	Mean = 24, Median = 18, Mode = 18 (54%), Standard Deviation = 9
Level of Education (Years)	Mean = 14, Median = 14, Mode = 14 (36%), Standard Deviation = 2
Monthly Income (Thai Baht)	Mean = 16747, Median = 10000, Mode = 2500 (31%), Standard Deviation = 15127
Monthly Expenditure (Thai Baht)	Mean = 12050, Median = 10000, Mode = 10000 (41%), Standard Deviation = 10798
Device used to access the internet	Mode = Smartphone (63%)
Communication channel used to share product information	Mode = Online Social Media (55%)
Internet Usage (Hours)	Mean = 5, Median = 5, Mode = 3 (16%), Standard Deviation = 3

Table 5 includes descriptive statistics for the indicators of model variables.

Table 5 Model variables: validity, reliability and descriptive statistics

Variable and Indicator	Validity/Reliability			Descriptive Statistics				
	Factor Loading	Eigen value (% of Variance)	Cronbach Alpha	Mean	Standard Deviation	Skewness	Kurtosis	
Product Information Visualization	PV1	.76	.94	3.22	1.11	-.07	-.88	
	PV2	.71		3.08	1.10	-.01	-.79	
	PV3	.78		2.0 (6.5)	3.12	1.11	.04	-.74
	PV4	.77		3.05	1.16	.07	-.88	
	PV5	.71		3.14	1.11	.02	-.83	
Perceived Fluency	PF1	.84	.89	3.49	.91	-.08	-.36	
	PF2	.75		1.0 (3.4)	3.40	1.02	-.10	-.70
	PF3	.75		3.32	.98	-.14	-.46	
	PF4	.80		3.38	1.02	-.10	-.64	
Perceived Usefulness	PU1	.71	.93	3.10	1.07	.00	-.67	
	PU2	.66		1.1 (3.8)	3.21	1.07	-.07	-.74
	PU3	.72		3.19	1.02	-.07	-.59	
	PU4	.70		3.08	1.14	.00	-.81	
	PU5	.69		3.12	1.08	.01	-.65	
Product Information Interactivity	PI1	.70	.90	3.34	.97	-.13	-.46	
	PI2	.77		1.5 (5.1)	3.37	.97	-.17	-.32
	PI3	.76		3.38	.99	-.13	-.46	
	PI4	.69		3.32	.96	.01	-.63	
	PI5	.72		3.35	.95	-.02	-.45	
Product Information Credibility	PC1	.74	.92	3.13	1.03	.04	-.65	
	PC2	.77		1.7 (5.7)	3.02	1.08	-.01	-.87
	PC3	.69		3.09	1.02	.18	-.62	
	PC4	.73		3.12	1.06	.09	-.61	
	PC5	.72		3.25	.98	.12	-.55	
Product Information Sharing	PS1	.81	.92	3.29	1.04	.05	-.66	
	PS2	.79		3.22	1.02	.23	-.68	
	PS3	.86		15.7 (52.3)	3.10	.98	.00	-.56
	PS4	.77		3.07	1.00	.09	-.59	
	PS5	.49		3.32	.97	.05	-.80	
	PS6	.57		3.34	1.01	.16	-.89	

Note for factor analysis: Extraction Method: Principal Component Analysis. Rotation Method: Equamax with Kaiser Normalization. Rotation converged in 6 iterations. Kaiser-Meyer-Olkin Measure of Sampling Adequacy = 0.964. Bartlett's Test of Sphericity Approx. Chi-Square = 14662.269, $df = 435$, Significance = 0.00. Components with eigenvalues less than 1 are not shown. Percentage of total variance explained = 76.654%.

From Table 5, it is seen that the magnitudes of skewness and kurtosis for each indicator are within the acceptable limits of 3 and 7, respectively, which are the ones required for the use of maximum likelihood estimation in SEM analyses (Kline, 2016). For the purpose of descriptive analyses, the latent variables were converted into single interval scale measures using the weighted mean of the values of their indicators with the standard deviations as the weights. These single-scale measures are used only in the following descriptive analyses. The

separate values of the indicators were used in the SEM analyses.

T-tests showed that the mean values of the model variables were significantly greater than the neutral value of 3 on their 5-point scales except for PV2, PV4, PIC2, PU4, PS4 where the mean was not significantly different from 3 ($p < 0.05$).

Correlations among variables are shown in Table 6 where bold type indicates statistical significance at a level of 0.05 or less.

Table 6 Correlations

Variables	Age	Ed	I	E	U	D	C	PV	PI	PIC	PU	PF	PS
Education (Ed)	.160	1	Personal Characteristics										
Income (I)	.197	.072	1										
Expenditure (E)	.006	.042	.129	1									
Hours/Day (U)	-.013	.043	-.027	-.064	1								
Device (D)	.144	-.002	.100	.040	.081	1							
Channel (C)	-.111	-.027	-.047	-.096	.005	.030	1						
Product Information Visualization (PV)	-.356	-.094	-.245	-.210	.028	-.146	.098	1					
Product Information Interactivity (PI)	-.288	-.079	-.192	-.239	.052	-.108	.127	.646	1				
Product Information Credibility (PC)	-.316	-.058	-.243	-.175	.012	-.192	.058	.684	.584	1			
Perceived Usefulness (PU)	-.357	-.090	-.214	-.172	.001	-.158	.101	.738	.660	.719	1		
Perceived Fluency (PF)	-.286	-.095	-.172	-.118	.037	-.125	.074	.527	.567	.573	.582	1	
Product Information Sharing (PS)	-.314	-.156	-.234	-.192	.001	-.177	.086	.628	.609	.628	.642	.485	1

From Table 6, all of the coefficients associated with causal effects in the theoretical model are significant and positive. There are four significant correlations that suggest plausible effects that may be added to the theoretical model (Product Information

Visualization, Product Information Interactivity, and Product Information Credibility → Product Information Sharing; Perceived Fluency → Perceived Usefulness). These plausible additions are considered in the next section as part of the development of the model.

Model analyses and development

Figure 2 shows the results of the SEM analysis using Amos software for direct effects in the theoretical model. The notations * and NS indicate statistical significance at a level of .05 or less and not statistically significant at that level,

respectively. Unstandardized effects are shown first with standardized effects in parentheses and an interpretation of their magnitude according to Cohen (1988): ≤ 0.1 indicates a small effect (S); between 0.1 and 0.5 a medium effect (M); and ≥ 0.5 a large effect (L). These notations are used throughout all of the results for model analyses.

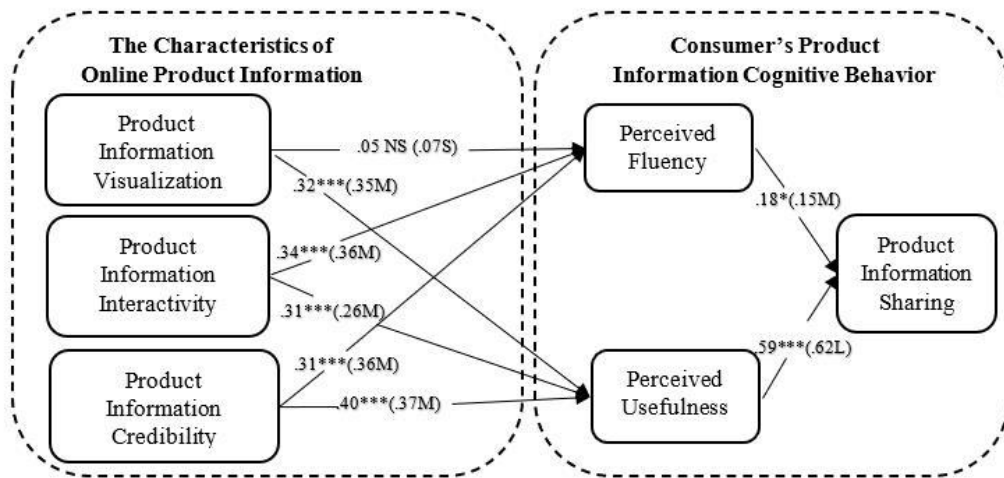


Figure 2 Direct effects in theoretical model

Table 7 shows a range of fit statistics for the theoretical model as recommended by Kline (2016).

Table 7 Fit statistics for theoretical model

Theoretical Model	N	Normed Chi-square ($NC = \chi^2/df$)	RMR	GFI	AGFI	NFI	IFI	CFI	RMSEA
	516	1199.865/394 = 3.05 R ² : PU (0.76), PF (0.50), PS (0.51)	0.063	0.873	0.850	0.920	0.95	0.945	0.060

From Table 7 it is seen that the fit statistics RMR, GFI and AGFI are slightly less than satisfactory, and the effect of Product Information Visualization on Perceived Fluency in

Figure 2 is small and not statistically significant. Consequently, it is desirable to seek an improved model. Three additional direct effects suggested by the significant correlations in Table 5 were

added to the theoretical model and, together with the effect of Product Information Visualization on Perceived Fluency, these five effects were made optional in a specification search using Amos. The 32 models in the hierarchy

were analyzed and among these the model with the least value for NC was selected as the final model (Kline, 2016). Fit statistics for the final model are shown in Table 8 and direct effects are shown in Figure 3.

Table 8 Fit statistics for final model

Final Model	N	Normed Chi-square (NC = χ^2/df)	RMR	GFI	AGFI	NFI	IFI	CFI	RMSEA
	516	1134.882/392 = 2.895 R ² : PU (0.741), PF (0.492), PS (0.567)	0.053	0.876	0.853	0.924	0.949	0.949	0.058

The final model has improved fit statistics and reasonable proportions of the variance of the endogenous variables (R²) are explained by the model.

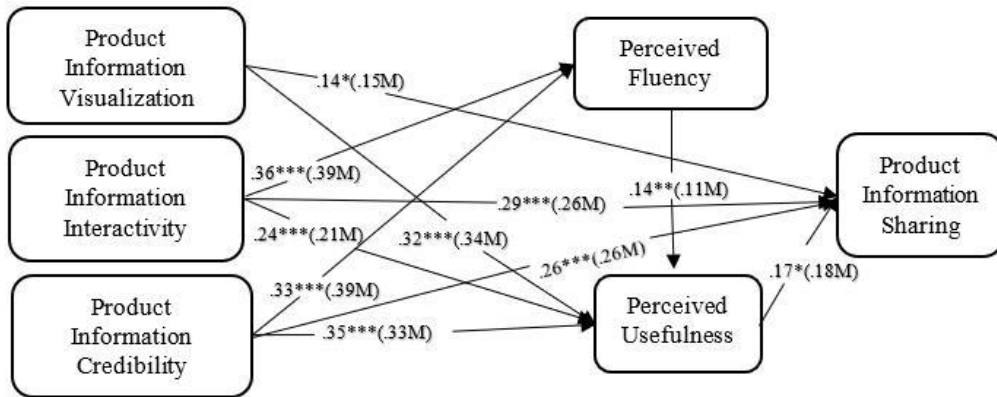


Figure 3 Direct effects in final model

Table 9 shows the indirect effects, the totals of indirect effects, and the totals of indirect and direct effects in the final model.

Table 9 Indirect effects and total effects in final model

Causal Variable	Indirect Effects on Product Information Sharing			Total Effects		
	Mediating Variable		Total of Indirect Effects	Affected Variable		
	Perceived Fluency	Perceived Usefulness		Perceived Fluency	Perceived Usefulness	Product Information Sharing
Product Information Visualization	Nil	.02NS (.03S)	.02 NS (.03S)	Nil	.32***(.34M)	.16** (.18M)
Product Information Interactivity	.01NS(.01S)	.04NS(.04S)	.05*(.05S)	.36***(.39M)	.29***(.38M)	.34***(.31M)
Product Information Credibility	.02NS(.01S)	.06*(.06S)	.08**(.07S)	.33***(.39M)	.46***(.37M)	.34***(.33M)
Perceived Fluency	Nil	.02NS(.02S)	.02NS(.02S)	Nil	.14**(.11M)	.02NS(.02S)
Perceived Usefulness	Nil	Nil	Nil	Nil	Nil	.17*(.18M)

Note: The statistical significance of indirect effects was determined following Cohen and Cohen (1983); and total effects were determined using nonparametric bootstrapping with 1,000 random samples.

Discussion of the findings

Participants

From Table 4, it is evident that the participants are young, well educated and have relevant experiences in online purchasing. None of the variables included in the model were considered to be unimportant in relation to online behaviors. Besides, T-test also showed that there were no significant differences between males and females except that females had significantly more values of income level and information device compared to males. From Table 6, it is seen that compared to younger participants, the older participants have high monthly incomes and earned higher formal education. However, on a daily basis and selected information channel,

the older participants did not significantly use the internet as often as their younger counterparts. None of the personal characteristics was correlated significantly with any of the characteristics of online product except information channel selection.

Research hypotheses for direct effects

The findings supported all of the eight research hypotheses for their direct effects (Table 2) except for *H1: product information visualization has a significant positive influence on perceived fluency*. Consequently, there is no evidence to suggest that increasing product information visualization will lead to significant increases in perceived fluency among consumers. However, from Table 6, it is evident that consumers who derive most fluency from product

information visualization consider such information to be attractive, comprehensive, reliable and accurate.

Indirect and total effects

The analyses of indirect and total effects provide more accurate and detailed information than is obtained by only considering direct effects. From Table 9, the five separate indirect effects of product information visualization, interactivity and credibility on product information sharing demonstrated a small yet not statistically significant effects except the product information credibility on product information sharing through perceived usefulness, which turned out to be statistically significant. Also, the totals of the indirect effects on product information sharing are small and statistically significant for product information interactivity and credibility, and not statistically significant and small for product information visualization.

In Table 9, all of the total effects in the final model are statistically significant, positive and medium in magnitude except perceived fluency. Considering the standardized total effects on product information sharing, the order from

greatest to least effect starts with the three online product information characteristics (product information credibility, interactivity and visualization) followed by the two consumer cognition behaviors (perceived usefulness and fluency). In contrast, if only direct effects are considered, the order of effects on product information sharing is quite different with perceived usefulness appearing to be more important and perceived fluency not important.

Among the three online product information characteristics, product information interactivity and credibility have the strongest influence on each of the two intervening consumer cognition behaviors (perceived fluency and usefulness) and product information sharing. Product information visualization has its strongest influence on perceived usefulness; product information interactivity and credibility have strongest influence on perceived fluency.

New findings

Table 10 summarizes findings that have not been reported in previous studies.

Table 10 New findings

New findings
Direct effects on Product Information Sharing due to Product Information Visualization, Product Information Interactivity, Product Information Credibility are positive, medium, and significant.
The direct effect on Perceived Fluency due to Product Information Visualization; Product Information Sharing due to Perceived Fluency are not statistically significant.
The total of the indirect effects on Product Information Sharing due to Product Information Interactivity, Product Information Credibility are positive, small and significant.
Total effects on Product Information Sharing due to Product Information Visualization, Product Information Interactivity, Product Information Credibility, are positive, medium, and significant.

These new findings require validation in further studies. In particular, they highlight the important need for studies of causal effects to analyze and report indirect effects and total effects rather than only direct effects.

Practical implications of the findings

From total effects in Table 8, it is possible to develop a hierarchical set of practical actions that increase consumer’s product information sharing. These are described in Table 11 with actions 1, 2 and 3 in decreasing order of their influence on consumer’s product information sharing.

Table 11 Practical actions to increase consumer’s product information sharing

Enterprise Action to Increase Consumer’s Product Information Sharing	Online Product Information Characteristics	Comment
<p>1. Ensure that information provided by the enterprise about products or services is: (a) suggestive; (b) instructive; (c) attribute; (d) believable; (e) an important stimulus can influence related consumer’s cognition process.</p>	<p>Product Information Credibility</p>	<p>The actions in 1 are the best means for increasing the consumer’s: (a) attention to the enterprise and its product information; (b) confidence in the commercial-oriented classifieds; (c) awareness of product to eliminate their doubts; (d) understanding about product features and attributes; (e) willing to make purchasing decision. Also, the actions in 2 contribute to achieving the same outcomes.</p>
<p>2. Ensure that the enterprise: (a) understands consumer needs and accurately answers consumer’s purchasing questions; (b) increases consumer’s perception about product knowledge and application; (c) can help consumer understand the potential features and advantages of the product; ;(d) conduct useful product information.</p>	<p>Product Information Interactivity</p>	<p>The actions in 3 contribute to increasing the consumer’s: (a) pleasure; (b) attention to the enterprise and its product information; (c) feeling of calmness, unrestricted freedom, and ability to access interested product information; (d) willing to make purchasing decision.</p>
<p>3. Ensure that online information provided by the enterprise about products or services is: (a) attractive; (b) comprehensive and well organized; (c) guides influence consumer’s perception about its product.</p>	<p>Product Information Visualization</p>	

The comments in Table 11 indicate additional direct influences on other consumer cognition behaviors (perceived fluency and perceived usefulness) that act as mediators in the indirect effects of enterprise’s online product information characteristics on consumer’s product information sharing behavior.

Conclusion

This present paper has shown that in an online information environment the most important influential factor on a consumer’s product information sharing is product information credibility (i.e., product information must: be reliable and accurate, believable, and increase



consumer's cognitive efficiency). Second, is product information interactivity (i.e., the enterprise's ability to: understand and answer consumer's purchasing questions; conduct useful product information to increase consumer's understanding about product features and attributes). Third, is product information visualization (i.e., online product information must be: attractive; useful; comprehensive and well organized; guides consumer's perception about its product).

The online product information characteristics have indirect influence on consumer's product information sharing by increasing: perceived fluency (i.e., online product information must be: comprehensive, simplicity, flexibility and easy for the consumers); and perceived usefulness (i.e., online product information can: meet and enhance consumer's expectation value; reduce consumer's purchasing cost; and be easy for purchasing decision making). However, perceived fluency is not influenced significantly by product information visualization and it does not directly influence product information sharing, but is influenced mainly by product information interactivity and credibility.

The theoretical contributions of the study confirm that: (a) effects among these behaviors in the western societies are also evident in the context of Thailand; and (b) there are new theoretical findings as shown in Table 10. New findings require further validation but certainly highlight the advantages of analyzing indirect and total effects rather than only direct effects. The discussion of the findings includes practical implications, which are drawn out from the theoretical results.

However, there are certain limitations on the findings. The external validity must be confirmed by further studies. Young people formed a large part of the sample and consequently older individuals were outnumbered by younger participants. It is possible that other enterprise and consumer's information behaviors are relevant and should be included in the model. However, the findings are useful and certainly contribute to an increased understanding of the relationships between the characteristics of online product information and consumer's product information sharing behaviors in online environments in the context of Thailand.

References

- Alter, A., Oppenheimer, D., Epley, N., & Eyre, R. (2007). Overcoming intuition: Metacognitive difficulty activates analytic reasoning. *Journal Of Experimental Psychology: General*, 136(4), 569-576. <https://doi.org/10.1037/0096-3445.136.4.569>
- Bederson, B., & Shneiderman, B. (2003). *The craft of information visualization* (1st ed.). Morgan Kaufmann Pub.



- Belk, R. (1975). Situational Variables and Consumer Behavior. *Journal of Consumer Research*, 2(3), 157. <https://doi.org/10.1086/208627>
- Chaiken, S., & Maheswaran, D. (1994). Heuristic processing can bias systematic processing: effects of source credibility, argument ambiguity, and task importance on attitude judgment. *Journal of personality and social psychology*, 66 3, 460-73.
- Claypool, H., Mackie, D., & Garcia-Marques, T. (2015). Fluency and Attitudes. *Social and Personality Psychology Compass*, 9(7), 370-382. <https://doi.org/10.1111/spc3.12179>
- Cohen, J., Cohen, P. (1983). *Applied multiple regression/correlation analysis for the behavioral sciences (3rd ed.)*. Mahwah, NJ, Erlbaum.
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Science (2nd, ed.)*. Hillsdale, NJ: Lawrence Earlbaum Associates
- Conati, C., Carenini, G., Toker, D., & Lallé, S. (2015). Towards User-Adaptive Information Visualization. *AAAI*, 15, 4100-4106.
- Cosenza, T.R., Solomon, M.R., & Kwon, W. (2015). Credibility in the blogosphere: A study of measurement and influence of wine blogs as an information source. *Journal of Consumer Behaviour*, 14, 71-91.
- Daugherty, P., Ellinger, A., & Rogers, D. (1995). Information accessibility: customer responsiveness and enhanced performance. *International Journal of Physical Distribution & Logistics Management*, 25(1), 4-17. <https://doi.org/10.1108/09600039510080117>
- Davis, F. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, 13(3), 319. <https://doi.org/10.2307/249008>
- Davis, F. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, 13(3), 319. <https://doi.org/10.2307/249008>
- Deckert, M. (2015). Processing fluency and decision-making: The role of language structure. *Psychology of Language and Communication*, 19(2), 149–161. <https://doi.org/10.1515/plc-2015-0009>
- Defleaur, M. (2017). *Mass communication Theories, Explaining Origins, Processes and Effects*. Pearson Education, Inc.
- Deimen, I., Ketelaar, F., & Le Quement, M. (2015). Consistency and communication in committees. *Journal of Economic Theory*, 160, 24-35. <https://doi.org/10.1016/j.jet.2015.08.004>
- Fiore, A., Kim, J., & Lee, H. (2005). Effect of image interactivity technology on consumer responses toward the online retailer. *Journal Of Interactive Marketing*, 19(3), 38-53. <https://doi.org/10.1002/dir.20042>



- Harris, P., Silience, E., & Briggs, P. (2011). Perceived Threat and Corroboration: Key Factors That Improve a Predictive Model of Trust in Internet-based Health Information and Advice. *Journal Of Medical Internet Research*, 13(3), e51. <https://doi.org/10.2196/jmir.1821>
- Hoffman, D., & Novak, T. (1996). Marketing in Hypermedia Computer-Mediated Environments: Conceptual Foundations. *Journal of Marketing*, 60(3), 50. <https://doi.org/10.2307/1251841>
- Hsieh-Yee, I. (2001). Research on Web search behavior. *Library & Information Science Research*, 23(2), 167-185. [https://doi.org/10.1016/s0740-8188\(01\)00069-x](https://doi.org/10.1016/s0740-8188(01)00069-x)
- Kahn, B., Strong, D., & Wang, R. (2002). Information quality benchmarks: product and service performance. *Communications of the ACM*, 45(4ve). <https://doi.org/10.1145/505999.506007>
- Kline. R.B. (2016). *Principles and Practice of Structural Equation Modeling* (4th, ed.). New York: The Guilford Press.
- Krifka, M. (2008). Basic notions of information structure. *Acta Linguistica Hungarica*, 55, 243-276.
- Lee, H. L., & Whang, S. (2000). Information sharing in a supply chain. *International Journal of Technology Management*, V20, 3, 373-387.
- Lee, H.L., Padmanabham, V., & Whang, S. (1997). The bullwhip effect in supply chains. *MITSloan Management Review*, Vol. 38(3), 93-102.
- Liu, Y., & Shrum, L. J. (2002). What is interactivity and is it always such a good thing? Implications of definition, person, and situation for the influence of interactivity on advertising effectiveness. *Journal of Advertising*, 31(4), 53–64. <https://doi.org/10.1080/00913367.2002.10673685>
- Mason-Jones, R., & Towill, D. (1997). Information enrichment: designing the supply chain for competitive advantage. *Supply Chain Management: An International Journal*, 2(4), 137-148. <https://doi.org/10.1108/13598549710191304>
- Mason-Jones, R., & Towill, D. (1998). Shrinking the supply chain uncertainty circle *IOM Control Magazine*, 24 (7)
- Mathieson, K., Peacock, E., & Chin, W. (2001). Extending the technology acceptance model. *ACM SIGMIS Database: The DATABASE for Advances in Information Systems*, 32(3), 86-112. <https://doi.org/10.1145/506724.506730>
- McKnight, D.H., & Kacmar, C.J. (2006). Factors of Information Credibility for an Internet Advice Site. *Proceedings of the 39th Annual Hawaii International Conference on System Sciences (HICSS'06)*, 6, 113b-113b.
- McMillan, S., & Hwang, J. (2002). Measures of Perceived Interactivity: An Exploration of the Role of Direction of Communication, User Control, and Time in Shaping Perceptions of Interactivity. *Journal of Advertising*, 31(3), 29-42. <https://doi.org/10.1080/00913367.2002.10673674>



- Munzner, T. (2008). Process and Pitfalls in Writing Information Visualization Research Papers. *Information Visualization*.
- Newhagen, J. (2004). Interactivity, Dynamic Symbol Processing, and the Emergence of Content in Human Communication. *The Information Society*, 20(5), 395-400. <https://doi.org/10.1080/01972240490508108>
- Paivio, A. (2007). *Mind and Its Evolution A Dual Coding Theoretical Approach* (1st ed.). Psychology Press.
- Paul, R. (2005). The state of critical thinking today. *New Directions For Community Colleges*, 2005(130), 27-38. <https://doi.org/10.1002/cc.193>
- Pettigrew, K. (1999). Waiting for chiropody: contextual results from an ethnographic study of the information behaviour among attendees at community clinics. *Information Processing & Management*, 35(6), 801-817. [https://doi.org/10.1016/s0306-4573\(99\)00027-8](https://doi.org/10.1016/s0306-4573(99)00027-8)
- Pettigrew, K.E., & McKechnie, L. (2001). The use of theory in information science research. *J. Assoc. Inf. Sci. Technol.*, 52, 62-73.
- Petty, R., Cacioppo, J., & Schumann, D. (1983). Central and Peripheral Routes to Advertising Effectiveness: The Moderating Role of Involvement. *Journal Of Consumer Research*, 10(2), 135. <https://doi.org/10.1086/208954>
- Petty, R., Kasmer, J., Haugtvedt, C., & Cacioppo, J. (1987). Source and message factors in persuasion: A reply to stiff's critique of the elaboration likelihood model. *Communication Monographs*, 54(3), 233-249. <https://doi.org/10.1080/03637758709390229>
- Pujara, A., & Kant, R. (2015). Supply Chain Information Sharing. *International Journal of Information Systems and Supply Chain Management*, 8(1), 22-38. <https://doi.org/10.4018/ijisscm.2015010102>
- Rafaeli, S., & Ariel, Y. (2007). Assessing interactivity in computer-mediated research. In A. N. Joinson, K. Y. A. McKenna, T. Postmes, & U.-D. Reips (Eds.), *The Oxford handbook of Internet psychology* (pp. 71–89). Oxford, UK: Oxford University Press.
- RAMAYAH, T., & OMAR, R. (2010). INFORMATION EXCHANGE AND SUPPLY CHAIN PERFORMANCE. *International Journal of Information Technology & Decision Making*, 09(01), 35-52. <https://doi.org/10.1142/s0219622010003658>
- Reinhard, M., Sporer, S., Scharmach, M., & Marksteiner, T. (2011). Listening, not watching: Situational familiarity and the ability to detect deception. *Journal Of Personality And Social Psychology*, 101(3), 467-484. <https://doi.org/10.1037/a0023726>
- Sadiku, M., Shadare, A., Musa, S., & Akujuobi, C. (2016). DATA VISUALIZATION. *International Journal of Engineering Research and Advanced Technology*, 02(12), 11-16.



- Shah, A. K., & Oppenheimer, D. M. (2007). Easy does it: The role of fluency in cue weighting. *Judgment and Decision Making*, 2(6), 371–379.
- Shah, A. K., & Oppenheimer, D. M. (2008). Heuristics made easy: An effort-reduction framework. *Psychological Bulletin*, 134(2), 207–222. <https://doi.org/10.1037/0033-2909.134.2.207>
- Shekelle, P., Morton, S.C., & Keeler, E.B. (2006). Costs and benefits of health information technology. *Evidence report/technology assessment*, 132, 1-71.
- Singh, J. (1996). The importance of information flow within the supply chain. *Logistics Information Management*, 9(4), 28-30. <https://doi.org/10.1108/09576059610123132>
- Straub, D., & Gefen, D. (2004). Validation Guidelines for IS Positivist Research. *Communications of The Association for Information Systems*, 13. <https://doi.org/10.17705/1cais.01324>
- Sun, S., & Yen, J. (2005). Information supply chain: A unified framework for information-sharing. *Lecture Notes in Computer Science*, 3495, 422-428. https://doi.org/10.1007/11427995_38
- Taylor, R. (1991). Information Use Environments. *Communication Sciences*, 10 (217), 55.
- Thomas, J., & Cook, K. (2006). A visual analytics agenda. *IEEE Computer Graphics and Applications*, 26(1), 10-13. <https://doi.org/10.1109/mcg.2006.5>
- Venkatesh, Morris, Davis, & Davis. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly*, 27(3), 425. <https://doi.org/10.2307/30036540>
- Venkatesh, Thong, & Xu. (2012). Consumer Acceptance and Use of Information Technology: Extending the Unified Theory of Acceptance and Use of Technology. *MIS Quarterly*, 36(1), 157. <https://doi.org/10.2307/41410412>
- Vieira, S. (2014). *The truths and myths of information authority*. SAGE.
- Yadav, M., & Varadarajan, R. (2005). Interactivity in the Electronic Marketplace: An Exposition of the Concept and Implications for Research. *Journal Of The Academy Of Marketing Science*, 33(4), 585-603. <https://doi.org/10.1177/0092070305278487>
- Zhang Xiangxian, Liu Hongyu, & Hu Yi. (2014). Formation Mechanism of Social Network Information Ecosystem and Empirical Study on Influencing Factors. *Library and Information Service*, (116): 36-41. <https://doi.org/10.13266/j>