

ปัจจัยสำคัญที่ส่งผลต่อพฤติกรรมผู้บริโภคในตลาดดิจิทัลของประเทศไทย:
การสังเคราะห์งานวิจัยโดยการทบทวนวรรณกรรมอย่างเป็นระบบและการ
ทำเหมืองข้อมูล

Key Factors Affecting Consumer Behavior in Thai Digital Marketing: Research Synthesis by Systematic Literature Review and Data- Mining Techniques

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Abstract

This research was conducted using systematic literature review and data-mining techniques to create predictive models of key factors affecting consumer behavior in digital marketing in Thailand. The data analysis is based on 50 synthesized pieces of literature regarding the relationship of digital marketing factors with a systematic review process. Techniques for data-mining relationship rules were employed to create a relationship model and prediction.

The results of the study showed that there were 84 variables from 50 research papers. The top five most frequently studied variables are purchase intentions, customer satisfaction, reliability, attitude, and quality of the product and service. Data from 50 synthetic literature was analyzed using data-mining

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techniques. Afterward, a predictive model from an association rule was created. The predictive model was able to predict the most variables under the study, which are attitude and purchase intentions or services. The chance that a pair/variable group will be studied in future research is 12.72%. This predictive model can guide researchers and marketers to conduct digital marketing studies, accurately study key factors influencing consumer behaviors, be a guide to find out related variables of consumer behavior, and plan marketing strategies that fit the context of Thailand.

Keywords: *Predictive Model, Association Rule, Data Mining, Digital Marketing*

บทคัดย่อ

การวิจัยนี้เป็นการศึกษาด้วยการทบทวนวรรณกรรมอย่างเป็นระบบและใช้เทคนิคการทำเหมืองข้อมูล เพื่อสร้างตัวแบบทำนายผลปัจจัยการตลาดดิจิทัลในประเทศไทย ชุดข้อมูลเพื่อวิเคราะห์มาจากการสังเคราะห์งานวิจัยจำนวน 50 เรื่องที่ศึกษาความสัมพันธ์ของปัจจัยต่าง ๆ ทางการตลาดดิจิทัล ด้วยกระบวนการทบทวนวรรณกรรมอย่างเป็นระบบ และเทคนิคสำหรับกฎความสัมพันธ์ของ Data Mining ถูกนำมาใช้เพื่อสร้างแบบจำลองความสัมพันธ์และตัวแบบทำนายผล

ผลการศึกษาจากการทบทวนวรรณกรรมอย่างเป็นระบบพบว่าตัวแปร 84 ตัวจากงานวิจัย 50 ฉบับ ตัวแปรที่ถูกศึกษาบ่อย 5 อันดับ คือ ความตั้งใจซื้อ ความพึงพอใจของลูกค้า ความน่าเชื่อถือทัศนคติ และคุณภาพของผลิตภัณฑ์/บริการ ชุดข้อมูลจากวรรณกรรมสังเคราะห์ 50 ฉบับ ถูกนำไปวิเคราะห์โดยใช้เทคนิคการทำเหมืองข้อมูลด้วยเทคนิค หลังจากนั้นได้สร้างตัวแบบทำนายผลจากกฎความสัมพันธ์ (Association-Rule) ตัวแบบทำนายผล (The Predictive Models) สามารถทำนายถึงกลุ่มตัวแปรที่ผู้วิจัยจะเลือกศึกษาในเวลาเดียวกันมากที่สุดในงานวิจัยการตลาดดิจิทัล คือ ทัศนคติและความตั้งใจซื้อหรือใช้บริการ โดยมีโอกาสที่คู่/กลุ่มตัวแปรจะถูกศึกษาในงานวิจัยในอนาคต 12.72% ตัวแบบทำนายผลนี้สามารถช่วยให้นักวิจัยและนักการตลาดใช้เป็นแนวทางสำหรับการศึกษาวิจัยการตลาดดิจิทัลและศึกษาปัจจัยสำคัญที่มีอิทธิพลต่อพฤติกรรมผู้บริโภคได้อย่างถูกต้องเหมาะสม และใช้เป็นแนวทางในการค้นหาตัวแปรที่เกี่ยวข้องของพฤติกรรมผู้บริโภค และใช้เป็นแนวทางการวางแผนการตลาดที่เข้ากับบริบทของประเทศไทย

คำสำคัญ: *ตัวแบบทำนายผล กฎความสัมพันธ์ การทำเหมืองข้อมูล การตลาดดิจิทัล*

Introduction

Statement of the problems

The Internet and the rapid development of technology reveal a new global market (Cooper, 2019; Racolta-Paina & Luca, 2010). Additionally, these advancements lead to the emergence of a new consumer profile called the ‘digital consumer’ (Díaz, Gómez & Molina, 2017; Racolta-Paina & Luca, 2010). These consumers play an important role in the e-commerce world and they have different purchasing habits compared with traditional consumers. Companies must pay attention to digital consumers’ needs, habits, lifestyles and characteristics to satisfy them in a more global, competitive and dynamic environment (Wan, Ma & Pan, 2018). Due to its characteristics (e.g., having neither time nor location constraints), utilizing the web as a sales channel is key to reaching different, wide, and global markets in order to satisfy digital consumers’ needs and to be an important player in such a global and competitive market, companies should understand consumers’ characteristics, their digital purchase or services Intentions and digital behaviors.

What is digital marketing? Digital marketing is an umbrella term that includes anything that requires the use of an electronic device, including online marketing. Examples of this include broadcasting, digital out-of-home (OOH) advertisements, podcasts and e-books. Digital marketing has been growing with the dominance of digital platforms in the 21st century, replacing traditional marketing. While online marketing is a subset of digital marketing, it encompasses all marketing that utilizes the internet. Websites, blogs, social media and emails are all methods of online marketing. As online marketing is concerned with recruiting customers and establishing an online presence, digital marketing encompasses more than the usage of social media (Morris, 2009).

Why digital Marketing is more important? In this contemporary era, traditional marketing is fading away with the penetration of Digital marketing which has spread many different branches including social media (Facebook, Instagram, Twitter, Snapchat, YouTube, Pinterest, and LinkedIn) (Chaffey & Ellis-Chadwick, 2019) The pace of information sharing has never been as rapid as it is in this era and to facilitate this explosion of new changing information, digital marketing has a role to play. Digital marketing empowers the consumers to market the products which they feel are worthy of purchase along with detailed discussions on the features, quality, durability, design and functionality of various products across industries (Dodson, 2016). Moreover, associated factors of consumer behavior are one of the massively studied topics by the researchers and marketers in the past and still being studied (Dahiya & Gayatri, 2018). For example, Ashraf (2019) studied Islamic marketing and consumer behavior toward halal food purchase in Bangladesh. The results show that Islamic marketing

has a significant impact on the characteristics associated factors of consumer behavior of Muslim consumers and therefore affects their key choices about certain products and services. At several reasons, why you need to implement digital marketing into your branding strategy today: More consumers on social media (Heinonen, 2011), build targeted traffic to website and business (Ratten, 2016), grow brand's standing (King, 2017), save money and increase revenue, increase conversion rates, attract the attention of mobile users (Hyder, 2016), and online shoppers in Thailand to reach 14 million by 2021 (EcommerceIQ, 2017)

Consumer behavior in digital marketing? Researchers show different reasons as to why associated factors of consumer behavior has been the topic of many academics and researchers. One of the common views is that understanding associated factors of consumer behavior have become a factor that has a direct impact on the overall understanding consumer behavior, marketing performance of the business's strategy (Kotler & Keller, 2012). The researcher aims to provide reviews of literature related to the study have been presented. The literature review analyses, describe, evaluate and summarize which are previously carried out in the field of consumer behavior of digital marketing in Thailand. It provides the basic understanding of factors associated decision making process of consumer and consumer response in online consumer as well as it provides research gap and direction to the study. A systematic study of literature review is helpful in developing clear focus and directive study.

Main research problems

Firstly, researcher studied books and academic documents related to digital business, digital marketing and consumer behavior theory/concepts. This study the researcher can summarize the study guidelines to clarify of research questions and to understand why digital marketing is so important and more powerful for present marketing in Thailand, and basic concept of consumer behavior and the black box model?

Consumer behavior is the understanding of fundamental concepts of how and why consumers behave in an actual way while digital shopping (Huete-Alcocer, 2017). In digital business, marketers would like to know about consumer behavior which Important not different from traditional marketing, which involves an understanding of different factors influencing behavior of consumers (Hahn & Kim, 2009).

Descriptive analytics using systematic review literature is a statistical method that is used to search and summarize historical data in order to identify patterns or meaning (Mehta & Pandit, 2018). A systematic literature review (SLR) identifies, selects and critically appraises research in order to answer a clearly formulated question. The systematic review should follow a clearly defined protocol or plan where the criteria

is clearly stated before the review is conducted. It is a comprehensive, transparent search conducted over multiple databases and grey literature that can be replicated and reproduced by other researchers. It involves planning a well thought out search strategy which has a specific focus or answers a defined question. The review outlines the types of information that were gathered, analyzed, and reported over specified time periods. The review must include the search terms, search tactics (including database names, platforms, and dates of search), and limits (Dewey & Drahota, 2016). This section's study questions are as follows: What are the fundamental principles of customer behavior? (First research question)

Predictive analytics using data mining techniques is the use of data, statistical algorithms and machine learning techniques to identify the likelihood of future outcomes based on historical data. The goal is to go beyond knowing what has happened to be providing a best assessment of what will happen in the future. The following part addresses the study question: What are the factors which influence customer behavior in Thailand's digital marketing? (Second research question) and What is the prediction model for the factors influencing customer behavior in Thailand's digital marketing (Third research question)

A consumer behavior is influenced by different factors. Consumer behavior is a part of human behavior and by studying previous consumer behavior; marketers can estimate how consumers might perform in the opportunity when making purchasing decisions (Kotler & Armstrong, 2010). The stimulus-response model (or the black box model) is a well-developed and tested model of buyer behavior and is summarized in the diagram below. The stimulus-response or "black box" model focuses on the consumer as a thinker and problem solver who responds to a range of external and internal factors when deciding whether to buy (Muzondo, 2016).

The external stimuli that consumers respond to include the marketing mix and other environmental factors in the market such as website characteristic, merchant characteristic, and characteristics of web as a sales channel (Rose, S., Hair, N., & Clark, M., 2011). The marketing mix represents a set of stimuli that are planned and created by the company (Wu & Li, 2018). The environmental stimuli are supplied by the economic, political, cultural circumstances of a society. Together these factors represent external circumstances that help shape consumer choices (Platania, Platania & Santisi, 2016).

The internal influence factors affecting consumer decisions are described as the "black box." This "box" contains a variety of factors that exist inside the person's mind (Ramya & Ali, 2016). These include characteristics of the consumer (Psychological factors), such as their beliefs, attitude, motivation, perceived value, and so forth (Tyagi,

2018). Moreover, the decision-making process is also part of the black box, as consumers come to recognize they have a problem they need to solve and consider how a purchasing decision may solve the problem. As a consumer responds to external stimuli, their “black box” process choices based on internal factors and determine the consumer’s response—whether to purchase or not to purchase (Hopfe, Mc Leod, & Rollason, 2017).

The researchers like Kotler, Meyer and Eagle, Zeithaml, Davies have also contributed a lot to the area of consumer behavior. Following are the most accepted factors influencing consumer behavior (Panwar, Anand, Ali & Singal, 2019). Marketing and other stimuli enter the consumer’s “black box” and produce certain responses. The aim of marketing management is to discover what goes on in the mind of the consumer – the black box. The characteristics of the customer impact how he or she interprets stimuli; the decision-making process defines the consumer behavior that occurs. The first step in understanding buyer behavior is to focus on the factors that determine the buyer’s characteristics in the black box model. The researcher utilized the findings of the fundamental literature review above (Panwar, Anand, Ali, & Singal, 2019) to construct a research framework for this study. (Figure 1)

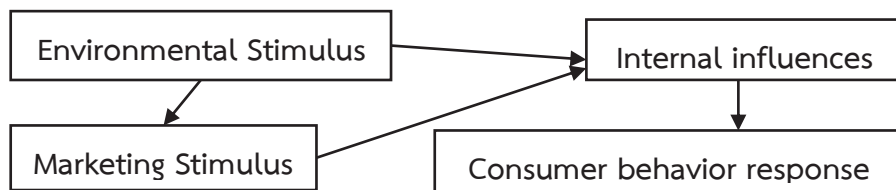


Figure 1 Theoretical framework for conceptual research framework Adapted from Panwar, Anand, Ali & Singal (2019) and Deepak & Jeyakumar (2019)

Research methodology

Data collection methods (Study eligibility and searching strategy)

In study eligibility, this article study method is a literature review using research synthesis, which is a narration synthesis and uses secondary data from relevant documents and research. The research uses electronic databases to search for 13 Thailand’s most renowned academic databases such as Thammasat university theses, Chulalongkorn university intellectual repository, CMU e-Thesis, Silpakorn university dspace, and Thai Digital Collection (TDC) published for the past 10 years from 2010 to the present.

According to the flowchart of the search strategy (figure 2), which was derived from Bohner, Neto, Ahmed, Mori, Lagana, and Sesma (2016), The search phrase, which is a collection of relevant keywords in several categories, is the main term in the

literature search. According to the study goals, there are two critical conditions: 1) (element, component, or determinant) and (consumer behavior or consumer reaction) and (digital marketing or online marketing); and 2) (variables or factors) (e-consumer behavior or e-marketing behavior) which has inspected the following documents: The first step is to compile a list of main screening publications. Following that, the search procedure was continued independently by exploring the listed electronic databases. The search strings were input to each of the electronic databases to retrieve the literary works based on the titles, abstracts, topics and keywords, depending on the advanced search facility provided by the databases. The metadata of the literature found from the searching process was recorded in the Excel file format (.xlsx), individually by database. The file has fields for storing metadata about the literature: 1) database; 2) title; 3) author; 4) year; and 5) abstract. 6) type of document, 7) the name of the journal/conference; 8) the results; 9) the keywords; and 10) the statistics data. (see figure 2. flowchart of searching strategy)

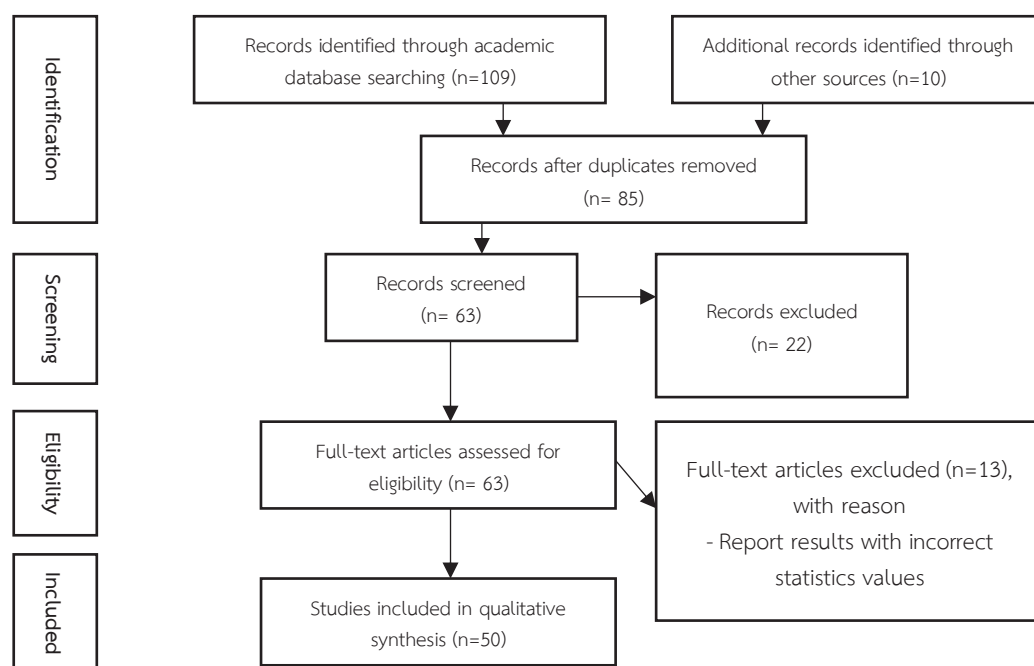


Figure 2 Flowchart of searching strategy

The researcher established inclusion and exclusion criteria in order to get literature on marketing and consumer behavior in Thailand. Providing coverage for research aims the selection criteria, which include the exclusion of irrelevant literature, are as follows: the literature must have been published between 2010 and the present, with emphasis on research that use statistics, correlation, regression, or/and a causal

model. Concerning the removal criterion, the literature lacks context for customer behavior and is thus incomplete.

Research quality evaluation and screening, the researcher chose to use the research quality evaluation developed by Wonglorsaichon, Wongwanich, & Wiratchai, N. (2014), contains 7 evaluation points, namely (1) the history and importance of research problems (2) documents and related research (3) method of research (4) data analysis results (5) result summary, discussion, and recommendations (6) research report presentation and (7) the quality of the research, amount 30 items has the characteristics of a 5-level gauge by specifying the rubric from 0-4, and the researcher applied the research quality evaluation form and the research quality evaluation criteria without any adjustment. The researcher has re-checked the quality of the equipment by finding inter-rater reliability by asking the cooperation of 2 experts who have at least 5 years of market research or related experience jointly study and understand in detail the scoring criteria for each level after that, the experiment was conducted to evaluate the research between the 3 assessors by randomly sampling 3 volumes and checking the consistency in grading using the formula of Copper and Hedges (2004). Criteria for interpretation of research quality assessment:

The rating is between 3.21-4.00, meaning very good quality.

The rating is between 2.41-3.20, meaning good quality.

The rating is between 1.61-2.40, meaning medium quality.

The rating is between 0.81-1.60, meaning relatively low quality.

The rating is between 0.00-0.80, meaning low quality.

Additionally, the researcher performed an intra-rater reliability test by re-evaluating all three theses two weeks apart. With a correlation coefficient of 0.85-0.91, it can be inferred that all three assessors were capable of assessing the quality of study closely. According to the findings of the internal consistency check, the consistency was determined to be within 0.92-0.96. As a consequence, it may be inferred that the researcher is capable of evaluating the quality of the study findings using a consistent evaluation process throughout both evaluations. Following that, secondary screening involves reading titles and abstracts that address the research objectives and eliminating irrelevant literature from the database, leaving the researcher with 50 synthesizing literatures, Involved in marketing and consumer behavior in the synthesis of three volumes of books to understand the concepts and theories related to consumer behavior, including factors related by the investigators to synthesize information by using the content and analytic techniques.

Data extraction

Data extraction is performed in this stage is making the transaction data from

journal database. Extracted data is stored in a database and then followed by the data processing to the next stage.

Attributes selection

The attributes that will be used is journal ID (JID), independent factors and dependent factors item-name which aims to select what data will be used during the process of mining and the necessary database for purposes of analysis, since not all of the attributes used during the mining process.

Selecting modeling techniques and data analysis

In selecting modeling techniques and data analysis by using data mining, Association-rules will process transaction data to find patterns of correlation pairs of factors in research. In this stage the method used is association-rule. This study aims to find from the research of the past 10 years of research related to consumer behavior. What factors have been studied? What is the frequency of study for such factors? and find patterns of the relationship model of research that studies consumer behavior which factors are studied which factors are often studied together or any variable? When studied? Will study other factors together? The modeling techniques used in this research is the method of Association-rules while the algorithm used in this study is the algorithm frequent pattern growth (FP-Growth) because one important factor in data mining is the existence of rules to find a high-frequency pattern among the itemsets. It is called the Association-rule. FP-Growth is an algorithm included in Association-rules. FP-Growth is one of the alternative algorithms that can be used to determine the most common set of data in a dataset. The algorithm searches for the Association-rule by using the value parameters of support and confidence (Hofmann & Klinkenberg, 2016).

The first phase of the database search is used to calculate the support value of each item and select the item that meets the minimum support. The results of the database search known the frequency of occurrence of each item in the database and sort by the frequency of occurrence of the largest item. FP-Growth algorithm searching all possible subsets by generating conditionals *FP-Tree* and look for frequent itemsets, by applying the method of Divide and Conquer in the order of frequent list from the smallest number frequencies its appearance (Hofmann & Klinkenberg, 2016). From calculation confidence against the pattern formed above, then Association-rule that meet the requirement of confidence ≥ 0.5 and minimum support = 0.3.

Result

Research quality evaluation results when considering the quality of the research in general, it was found that the quality was good ($M = 2.36$, $SD = 0.67$). When considering

each category, it was found that the data analysis results were average. The highest quality was at a very good level ($M = 3.91$, $SD = 0.54$), followed by the conclusion, discussion and recommendations ($M = 3.43$, $SD = 0.55$). In this study we are using the content analysis by interpreting basic concept of consumer behavior in digital consumer conclusion, and additionally using RapidMiner studio educational version 9.6.0 (a software package that allows data mining, text mining and predictive analytics) as simulation tool to perform data mining simulation using FP-Growth algorithm and Association-rules method on 50 synthesizing literature to find out and analyze the factors affecting on the Digital consumer behavior.

The basic principles of consumer behavior

Digital consumer behavior, in terms of marketing research, essentially boils down to anything that a person does online. What devices they use, the sites they visit, the ads they engage with, the pages they navigate to, when they leave and how, and so on. Digital channels and technology such as mobile, the cloud, gamification, cognitive computing and social media have disrupted the consumer experience completely. So much so, that we should regard every consumer as a digital consumer. In conclusion, digital consumer behavior: with people spending hours every day either actively or passively connected to the online world, it's no wonder so many consider it a significant part of the future of marketing. It holds a wealth of information that, even a decade ago, marketers could not even begin to dream of. Meanwhile, its technological position makes it easier than ever to implement.

With the emergence of digital marketing, it is not an easy task anymore to try to attract the consumers. What looks good to them is what really convinces them to go ahead with the purchase. Consumer will make comparisons of your brand with your competitors and will go for the one that suits them the best in terms of all the elements. To match the consumer-set standards, every brand has to make sure to be on their toes and everyone has maintained its presence on the social media platforms.

Consumer impact from traditional to digital marketing: Marketers influence consumer decisions by delivering an online marketing experience that has a combination of functionality and information on products and services. Web experiences such as searching, selecting, evaluating information and online transactions assist marketers to determine the potential of their online strategies. An increased amount of funds is being invested into digital marketing, and organizations utilize different techniques to expose consumers to their brands (Bright & Daugherty, 2012).

According to research undertaken by Tiago and Verissimo (2014), the web is a resourceful tool for organizations to create strong brands and gain a competitive advantage. Firms have utilized the benefits of the internet through the adoption of

social media in order to provide information and connect with consumers and stakeholders to generate sales (Tiago & Verissimo, 2014). Furthermore, consumers are responsive to social media marketing implemented by retailers; it was argued that retailers need to plan and coordinate their marketing strategies to implement them across the different platforms to engage with consumers and generate sales.

According to Stone and Woodcock (2013), digital marketing is used throughout the customer cycle, from brand awareness creation to encouragement to purchase, purchase assistance support for convenient purchasing, brand usage assistance and management of after sale consumer service. Moreover, research highlighted that digital marketing through social media leverages marketing communication channels and is a substitute for traditional marketing channels to connect with consumers.

The various studies discussed above found that digital marketing is a powerful marketing tool for reaching consumers. There are various methods of connecting to consumers through digital marketing which are listed above, and as indicated by the research studies, digital marketing has a significant impact on consumers through engagement, exposure to the brand, fostering relationships and influencing purchases, which results in sales of the product.

Importance of consumer behavior: Consumers gain valuable insights in their consumption-related behavior. It makes them wiser consumers. Marketers are benefited by understanding how consumers take consumption decisions, which enable them to formulate suitable marketing strategies. This is a positivist approach to consumer behavior. Consumer behavior was considered just applied digital marketing management. However, drawing from diverse disciplines, consumer behavior developed into an interdisciplinary subject. It becomes a subject of study going beyond narrow marketing and managerial perspective (De Mooij, 2019).

Many factors influence a digital consumer's purchasing decisions and online consumer behavior. The literature classifies and structures these factors in various ways. Despite these differences, consumer behavior is generally influenced by factors that can be classified into five groups: cultural factors, social factors, physical factors, personal factors and the marketing mix. These factors are identified to discover the impacts they have on consumer behavior and assist marketers with selecting consumer targeting strategy. Therefore, these factors are used to segment the market and target specific consumer groups (Ramya & Ali, 2016). The aim of this paper is to understand the influences of the factors that were measured in a survey on purchasing behavior. Marketers must pay attention and organize external stimuli. So that consumers need products, this incentive is considered an incentive to buy products. The conscience of the buyer which is like a black box that the manufacturer or seller cannot know must

try to search the conscience of the buyer. Buyers' sentiments are influenced by the characteristics and decision-making processes of the buyer, the purchasing decisions of consumers or buyers. Consumers will make decisions on various issues. From product selection, brand selection vendor selection, choosing the time of purchase and choosing the purchase quantity (Basil & Bolls, 2018).

Factors influencing consumer behavior in Thailand digital marketing

According to literature analysis results (50 synthesizing literature), many independent factors are identified. While some of the independent factors cited in Table 1 and 2 pertain to only one article, other independent factors appear in multiple articles. All factors are classified according to their similarities. Some of the main categories in Figure 2 are adapted from the literature (Cheung, 2009). However, all sub-categories and remaining main categories are developed according to the similarities of factors. The main categories are external stimulus (environmental and marketing factors), internal influences, and consumer behavior response.

Table 1 Descriptive 50 synthesizing literature and the factors affecting on the consumer behavior

84 factors	STUDIES (Journal ID: JID)
Social network	[E68]
Social Community	[E80]
Social Connection	[E80]
Situational involvement	[E3]
Social norm	[E55a] [E55b]
Subjective norm	[E61]
Social Influence	[E89]
Social support	[E62]
social commerce constructs	[E62]
System Quality	[E7] [E10] [E20] [E70]
Content Quality	[E2] [E7] [E10] [E18] [E20] [E80]
Commerce	[E80]
Technology	[E6]
Website Efficiency	[E9]
Safety in use	[E19] [E94]
Reliability	[E19]
Fast response	[E19]

Table 1 (cont.)

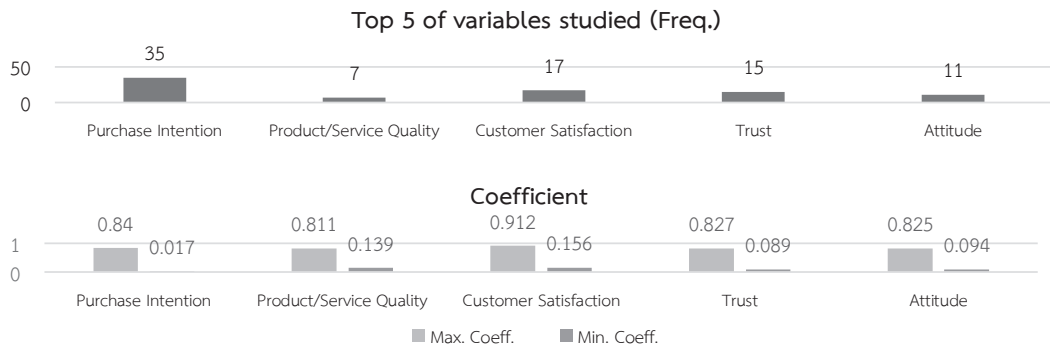
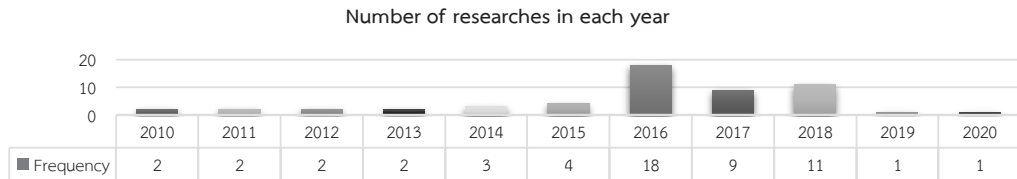
84 factors	STUDIES (Journal ID: JID)
Easy to use	[E19]
Privacy and personal services	[E9] [E62]
Payment methods	[E46]
Online design	[E18]
Information disclosure	[E62]
SMS	[E81]
MMS	[E81]
Experience	[E2]
Lifestyle	[E43]
Brand positioning	[E10] [E68]
Brand communication	[E10]
Brand image	[E4] [E7] [E10] [E14]
Digital advertising	[E73] [E94]
Digital media direct sale	[E73]
Digital media PR	[E35] [E73] [E94]
Digital media direct marketing	[E73]
Strategic management	[E6]
Values	[E96]
Media exposure	[E22] [E47]
Social media	[E95]
CRM	[E95]
CSR of customers	[E28]
Product/Service quality	[E7] [E8] [E20] [E28] [E53] [E70] [E95]
Digital marketing	[E27] [E28] [E29] [E42] [E43] [E70]
Marketing mix	[E6] [E14] [E43] [E78]
Service	[E15]
Product	[E9] [E58] [E63]
Price	[E15] [E63] [E93]
Place	[E15] [E58] [E63]
Promotion	[E9] [E15] [E58] [E63] [E94]
Replacement ability	[E9]
Variety	[E9]

Table 1 (cont.)

84 factors	STUDIES (Journal ID: JID)
Privilege and Bargain	[E9]
Event	[E35]
Technology acceptance	[E8] [E24] [E44] [E55a] [E55b]
Brand trust	[E3] [E4] [E53] [E68]
Brand awareness	[E9] [E10]
Brand value	[E15]
Recognition of the value of online channels	[E53]
Purchase intention	[E2] [E3] [E9] [E18] [E22] [E24] [E26] [E27] [E28] [E29] [E33] [E42] [E43] [E44] [E47] [E56] [E62] [E63] [E64] [E67] [E68] [E70] [E73] [E78] [E79] [E80] [E81] [E83] [E87] [E88] [E89] [E91] [E95] [E96]
Repurchase intention	[E18]
Customer satisfaction	[E6] [E7] [E8] [E10] [E14] [E15] [E17] [E187] [E19] [E20] [E24] [E25] [E53] [E55a] [E55b] [E67] [E96]
Perceived value	[E7] [E15] [E42] [E83] [E96]
Ease to use recognition	[E2] [E19] [E46] [E64] [E89] [E91]
The benefits recognition	[E2] [E19] [E26] [E64] [E89] [E91]
Risk recognition	[E3] [E56] [E88] [E91]
Pleasure	[E18]
Arousal	[E18]
Attitude	[E27] [E33] [E42] [E47] [E55a] [E55b] [E58] [E61] [E64] [E83] [E87]
Egoistic motives	[E61]
Altruistic motives	[E61]
collective motives	[E61]
Brand loyalty	[E9] [E26] [E31]
Customer loyalty	[E7] [E8] [E14] [E15] [E53] [E67]
Use (to benefit)	[E10] [E19]
Performance	[E6]
The value of e-sharing	[E4]
Brand engagement	[E4] [E31]
Actual purchase	[E18]
Continuance usage	[E17]
Cognitive loyalty	[E17]
Affective loyalty	[E17]
Word-of-mouth Intention	[E55a] [E55b] [E61]

Table 1 (cont.)

84 factors	STUDIES (Journal ID: JID)
e-WOM	[E31] [E35] [E55a] [E55b] [E61] [E79]
The interested in using	[E26]
Trust in members	[E17]



The findings of a fifty-study analysis. These studies were conducted in 2016 (18 studies), 2018 (11 studies), 2017 (9 studies), 2015 (5 studies), 2014 (3 studies), and 2010-2013 (2 studies per year). 84 variables were discovered in 50 studies. That is frequently studied Top five are Customer satisfaction (17 times, coefficient= 0.043-0.912), Trust (15 times, coefficient= 0.089-0.827), Attitude (11 times, coefficient= 0.094-0.825), and Product/Service quality (7 times, coefficient= 0.139-0.811)

Table 2 Example from 50 synthesizing literature

JID	REVIEW OF PREVIOUS WORK	Research method (Statistics)
E2	Thamma, N. (2019). Previous Online Shopping Experience toward an Online Repurchase intention Model. <i>Journal of Rang sit Graduate Studies in Business and Social Sciences</i> , 5(1), 62-71.	Correlational research (Causal model)
E3	Srisawat, T., Makmee, P., Suksawang, P. (2016). a causal relationship model among situational involvement, risk perception, and trust expectation as they affect Intention to buy from an e-tailer of Thai customers. <i>Journal of Graduate School of Commerce-Burapha Review</i> , 11(2), 31-46.	Correlational research (Causal model)
E4	Udomthanavong, S. (2018). The influences of perceived brand equity of motor vehicles via social media on electronic sharing value and brand engagement of customers. <i>Suddhiparitad</i> , 32(102), 249-263.	Correlational research (Regression)

Table 3 Example of Frequent Itemsets (FG-Growth)

Item Size	Support	Item 1	Item 2	Item 3
2	0.145	Purchase intension	Trust	
2	0.127	Purchase intension	Attitude	
2	0.109	Customer satisfaction	Trust	
3	0.073	Purchase intension	Ease to use recognition	The benefits recognition

From table 3, data analysis using data mining, in addition to understanding the current data being analyzed can still predict future trends of data. From datamining techniques and data analysis by using RapidMiner software, **frequent itemsets** are groups of items that often appear together in the data. It is important to know the basics of marketing data analysis for understanding frequent itemsets. Data is used to describe a common form of a many-to-many relationship between two kinds of objects (In RapidMiner called the market-basket model analysis).

Identifying the correlation between health data items has been extensively studied by data mining community. In the context of research along this direction, a transactional set is called the database. Each transaction is regarded as a set of items, namely an “itemset”. Association rule learning is a salient method for discovering relation between itemsets in database. Most commonly used methods for generating association rules include apriori, eclat and FP-Growth. FP-Growth can find frequent itemsets with minimal accesses to the original database, which is the most efficient approach among these. In addition, it also avoids the problem of excessively large amount of candidate itemsets. FP-Growth uses a special prefix tree (FP-Tree) to organize data. The design greatly reduces demand for data storage, which processes the FP-Tree to mine frequent itemsets instead of having to mine the original database (Wang, Chen, Shi, Zhang, Duan, Chen & Hu, 2017).

From this study, studying factors in each research study, there are a number of factors from 2 factors to 3 factors, for example, the group of factors that are most often will be studied together are **purchase intention-trust** by the opportunity to conduct research on this variable group have a chance 14.5% of all digital marketing research will be studies (Support= 0.145). , **purchase intention-attitude** (12.7%), **customer satisfaction-trust** and **customer satisfaction-customer loyalty** (10.9%) By considering the frequent item set that is 3 factors (not more than 5 factors) and establishing Association-rule that will be studied in which group of factors will continue to study.

Develop predictive model of factors influencing consumer behavior in Thailand digital marketing

Following the discovery of frequent itemsets, the next stage will be to develop association-rule rules, the majority of which will be necessary to evaluate the rules' efficacy and identify which rules are interesting and may be reused. There are two generally used indicators of a relationship rule's effectiveness: 1) The confidence values indicate the relationship rule's confidence that, when the left-hand-side (LHS) factors pattern happens, a certain percentage of the right-hand-side (RHS) factors pattern will occur (percent). 2) The lift value indicates the strength of the association between two variables in a factor analysis. If the lift value is larger than 1, then it is more probable that research of shared variables (left and right factors) will occur than separate studies. As a result, relationship rules with a lift value more than 1.0 are seen as fascinating and effective.

The association-rules will process transaction data to find patterns of correlation pairs of factors in research and have relationships between them until being able to create Association-rules. From table 4, which is sorted by the confidence value from highest to lowest, researcher found association-rules that:

Table 4 Example of Association-rules 31 other Association-rules from total 36 rules

Premises (Left-hand-side item: LHS)	Conclusion (Right-hand-side item: RHS)	Support	Confidence	Lift
Trust	Purchase intension	0.145	Infinity	Infinity
Attitude	Purchase intension	0.127	Infinity	Infinity
Customer satisfaction	Trust	0.109	Infinity	Infinity
Customer satisfaction	Customer loyalty	0.109	Infinity	Infinity
Digital marketing	Purchase intension	0.091	Infinity	Infinity

From table 4, establishing association rules after frequent itemset has been found; the resulting model is used to create relationship rules. For example, trust (on the LHS side) => purchase intension (on the RHS side) means that when the researcher chooses to study a variable: trust, and the researcher chose to study the Purchase intension variable as well. Or another example, customer satisfaction (on the LHS side) => trust (on the RHS side) means that when the researcher chooses to study the customer satisfaction factor, the researcher chooses to study the trust variable as well. The 5 most promising relationship rules out of 31 other association-rules. it is most likely that the researchers will choose to study these 5 variable groups: 1) trust and purchase intention 2) attitude and purchase intention 3) customer satisfaction and

trust 4) customer satisfaction and customer loyalty, and 5) digital marketing and purchase intention with a 14.5%, 12.7%, 10.9%, 10.9%, and 9.1% sorted according to the order of occurrence, descending of research going into the future

Kernel k-means, this operator use the kernel k-means method to do clustering. The k-means technique is an exclusive clustering algorithm, which implies that each item is allocated to one of a limited number of clusters. Objects included inside a cluster are similar to one another. The resemblance between items is determined by their distance from one another. Kernel k-means is a distance estimation technique that makes use of kernels to determine the distance between items and groups. Due to the nature of kernels, it is required to total the values of all cluster members in order to determine a single distance. As a result, this technique is quadratic in terms of sample size and, in contrast to the k-means operator, does not provide a centroid cluster model. If the add cluster attribute option is set to true, this operator generates a cluster attribute in the generated example-set (Wang, Chen, Shi, Zhang, Duan, Chen & Hu, 2017).

Table 5 Cluster 0 (84 factors in k-means clustering using data mining, based on RapidMiner's cluster model table)

Variable (Coefficient)	Frequency	Variable (Coefficient)	Frequency
Social norm (0.530-0.570)	2	collective motives (0.163)	1
Attitude (0.094-0.825)	11	Subjective Norm (0.162)	1
Word-of-mouth Intension (0.094-0.710)	3	electronic word-of-mouth (0.248-0.950)	6
Egoistic motives (0.193)	1	Technology Acceptance (0.380-0.710)	6
Altruistic motives (0.132)	1		

Table 6 Cluster 1

Variable (Coefficient)	Frequency	Variable (Coefficient)	Frequency
Brand positioning (0.095)	2	Brand image (0.117)	6
Brand communication (0.446)	1	Customer loyalty (0.151-0.710)	6
Brand trust (0.156-0.540)	4	Content quality (0.087-0.510)	6
Brand awareness (0.116-0.586)	2	System quality (0.197-0.250)	4
Use (to benefit) (0.193-0.635)	2	Customer satisfaction (0.043-0.912)	17
Recognition of the value of online channels (0.881)	1	Product/Service quality (0.139-0.811)	7
Perceived value (0.156-0.912)	5	Trust (0.089-0.827)	15
Digital marketing (0.179-0.782)	4		

Table 7 Cluster 2

Variable (Coefficient)	Frequency	Variable (Coefficient)	Frequency	Variable (Coefficient)	Frequency
Social network (0.185)	1	Repurchase intention (0.771)	1	Cognitive Loyalty (0.827)	1
Brand loyalty (0.197-0.810)	3	Strategic management (0.30)	1	Affective Loyalty (0.568)	1
Brand value (0.550)	1	Technology (0.160)	1	Payment methods (0.056)	1
Social community (0.246)	1	Experience (0.510)	1	Online design (0.479)	2
Social connection (0.125)	1	Ease to use recognition (0.142-0.710)	6	Pleasure (0.341)	1
Commerce (0.258)	1	The benefits recognition (0.203-0.530)	6	Arousal (0.253)	1
Performance (0.490)	1	Risk recognition (0.033-0.960)	4	Event (0.160)	1
The value of e-sharing (0.608)	1	Situational involvement (0.087)	1	Information disclosure (0.309)	1
Brand engagement (0.606-0.950)	2	The Interested in using (0.435)	1	Social influence (0.347)	1
Digital advertising (0.138-0.203)	2	Values (0.348)	1	Social support (0.281)	1
Digital media direct sale (0.200)	1	Media exposure (0.103-0.430)	3	social commerce constructs (0.115)	1
Digital media PR (0.201-0.259)	3	Social media (0.141)	1	SMS (0.101)	1
Digital media direct marketing (0.2107)	1	CRM (0.349)	1	Price (0.092-0.550)	3
Actual purchase (0.223)	1	CSR of customers (0.142)	1	Place (0.210-0.361)	3
Lifestyle (0.258)	1	MMS (0.319)		Promotion (0.135-0.484)	5
Website efficiency (0.477)	1	Privilege and Bargain (0.077)	1	Replacement ability (0.017)	1
Safety in use (0.258-0.306)	2	Trust in members (0.793)	1	Variety (0.192)	1
Reliability (0.193)	1	Continuance Usage (0.300-0.504)	3	Purchase intention (0.017-0.840)	35
Fast response (0.253)	1	Service (0.888)	1	Privacy and personal services (0.087-0.118)	2
Easy to access (0.235)	1	Product (0.125-0.241)	3	Marketing mix (0.046-0.370)	4

Clustering is the process of grouping objects that are similar to one another but distinct to those in other clusters. Clustering is a data extraction approach that utilizes unlabeled data to extract information. Clustering may be quite beneficial in a variety of different situations, for example, in a marketing application, we may be interested in identifying clusters of consumers that exhibit similar purchasing behavior (Wang, Chen, Shi, Zhang, Duan, Chen & Hu, 2017). Clustering of 84 associated factors of consumer behavior using RapidMiner, centroid value obtained from 3 clusters used, namely high frequent study cluster (H), normal frequent study cluster (M) and low frequent study cluster (L). Determination of the initial centroid value is done by

determining the large value (H), the average value (M) and the lower value (L) based on 2 assessment attributes (The frequency was studied with other variables, Correlation coefficient)

From table 5-7, Cluster analysis is an important analysis in almost every field of studies. Particularly in business environments, this one analysis plays a critical role in market segmentation and targeting potential customers. In simple terms, it is nothing but forming homogeneous groups from a heterogeneous collection of cases/subjects. Researcher ran k-means clustering using RapidMiner software. Later, researcher shall use k-mean clustering and to decide optimum number of clusters. 50 synthesizing literature and 84 factors can produce 3 cluster (0, 1, and 2). Cluster2 is the large variable group that is found to will be the most studied, while cluster0 is the small variable group that is found to will be the least studied.

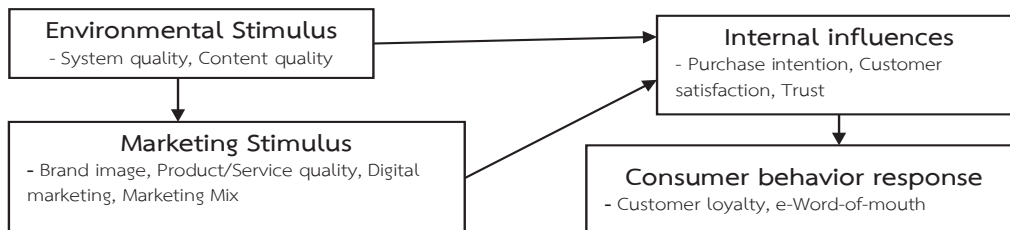


Figure 3 Predictive model for linked consumer behavior characteristics in Thailand digital marketing

From results of table 4-7, we developed predictive model (figure 3) from the most promising relationship rules out of 31 other Association-rules factors (table 4) and considered the most frequent factors (table 5-7) based on theoretical framework adapted from Panwar, Anand, Ali & Singal (2019) and Deepak & Jeyakumar (2019). In order to persuade the consumers, the marketers must study the consumer behavior. So, influence of external stimuli (*cultural, social, personal and marketing*) and internal influences (*psychological factors and decision-making process*) on buying behavior will give marketers a clear understanding of behavior patterns. From figure 3, this study concluded that under a research framework Important factor influenced with consumer behavior and being frequently will be studied as predictive model for associated factors of consumer behavior in Thailand digital marketing follows: *environmental stimulus* (system quality, content quality), *marketing stimulus* (brand image, product/service quality, digital marketing, marketing mix), *internal influences* (purchase intention, customer satisfaction, trust), and *consumer behavior response* (customer loyalty, e-Word-of-mouth)

Conclusion and Discussion

Digital consumer behavior has many dimensions to study, consumers behave in different ways in varied situations. From the extensive review of literature, the following facts have been concluded. According to customer satisfaction, content quality, technology acceptance, trust, system quality, Purchase intention, Ease of use recognition, and the benefits recognition are the major influencing factors on the consumer behavior during online purchase and digital marketing. All the papers emphasize on the different influencing factors on the digital buyers' consumer behavior. Researchers have identified key factors like convenience, that affect buyer decision making in the purchase of products. But factors influencing on the consumer of services are yet not clearly studied. All the papers emphasize on the different influencing factors on the digital consumers' buying behavior. Researchers have identified key factors like digital marketing, marketing mix, trust, customer satisfaction, and social media that affect consumers' behavior (customer loyalty and e-Word-of-mouth). However, factors influencing on the buying of services are yet not clearly studied. Comparative studies of offline and digital shoppers' behavior related to certain products and services have not been thoroughly studied in Thailand. The researcher deems it necessary to conduct further studies in the future. While an international systematic review has discovered that the main factors which influence consumer behavior in digital marketing are the electronic commerce (EC) ecosystem (Saura, Palos-Sanchez, & Correia, 2019), mobile apps, social media platforms, and electronic word-of-mouth (Alghizzawi, 2019).

The researcher identified the most often made errors by researchers while performing literature reviews. As a result, low-quality research is developed. To avoid errors, scholars must use caution in many areas, including the following: The weakness of the analysis and synthesis of research conducted in Thai is the use of non-standard names or terminology for each variable. Each profession requires a unique vocabulary. As a result, the researcher must depend on reading the research's language, operational definitions, and literature review. What is the usual terminology for variables? Additionally, this analysis excluded gray literature, such as research reports from multiple departments and dissertations. This review of the literature is limited to the last ten years. Because it is also meant to supplement the predominant ideas and principles now in use. As a result, ideas and principles that have been utilized in the past but have not been mentioned in the last decade of research were omitted from the literature study. Rather than original sources, use secondary sources. The conclusions of the literature review were not properly connected to the researcher's work, and insufficient time was spent investigating the finest sources of information for reviewing literature relevant to your area of study. Finally, the systematic review did not include

journals with a high impact factor, which is a significant drawback or limitation of this study. The primary objective of this research is to do digital marketing research in Thailand. All of the connected investigations discovered by the researcher were conducted by Thai persons. Utilize the Thai language for publishing and publish only in Thai-language journals, resulting in a lack of research published at an international level or in a highly rated journal.

The future research will concentrate on a comparative examination of physical and online buyer behavior in relation to items and services. These reasons demonstrate unequivocally that marketers must adapt new techniques to attract online shoppers in the new age of digitalization. Consumer behavior is a dynamic process, which makes developing a loyal client a challenging task. However, with efficient online techniques and an understanding of consumer behavior, desired outcomes may be achieved.

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