Challenges in Using Big Data for Analyzing Consumer Behavior**

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Abstract

This research examined the use of big data in consumer behavior by focusing on the critical local marketing strategies of local modern trade businesses and store, and how to response customer needs and customer satisfaction. Methodologies are studied on questionnaires and in-depth interviews, using both qualitative and quantitative methods, which are employed to study consumer purchasing behavior in two provinces, namely Ratchaburi and Phuket. Finding that location factor influences with consumer purchasing both type of product, quantity of purchasing, and including a high positive opinion of consumer regarding on the convenience and variety of products for shopping at the local convenience store. Data analysis on consumer purchasing can create competitive advantage in business and increase in customer satisfaction as well. It is the fact that big data are very important tool for predictive consumer behavior model in the future. It can revolutionize in the local modern trade market based on the power of data analysis.

Keywords: Consumer decision - making / Big data / Consumer behavior / Local store marketing / Data analytics

Introduction

Half a century ago, it has been said that the business world has become disruptive changing focus on technology and data. Clayton Christensen, Harvard Business School professor, Christensen (2016) mentioned that a disruption displaces an existing market, industry, or technology and produces something new with more efficient, and be the pioneered the buzzword of “disruptive

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innovation" as a way to think about successful companies not just meeting customers' current needs, but anticipating customer unstated or future needs. It is destructive and creative. In marketing, disruptive technology is the main driver of the changing in digital world. It has affected with all industries are rely on the new production method; 3D printing, logistic system, financial transaction either crypto currency, or bit coin in cashless society, e-commerce, e-retailing, self-service, curbside pickup service, innovation will address a disruption to conventional model of operation, supply, delivery, and innovated service through facial recognition, robotics assistance, including automatics processing. These all things have influenced toward the consumers' purchasing decision making phenomenon which it focused on the significance of technology, and data.

Today many businesses have access data more than ever such as data from website, wireless devices, IoT devices, smart phone, customer relationship management process, operation warehouse, supply chain, customer purchasing, or even customer complaint, etc. With foresight, one can take advantage of these challenging big data requires much on high technology and innovations. Not only innovated technology but also valuable data driven is a competitive advantage for business, and understand deeply on throughout consume decision making process with purchasing experiences in order to repurchase and maximize satisfaction finally.

In 2017, the value of Fast-Moving Consumer Goods (FMCG) market in Thailand about 4.42 hundred thousand baht that it was worst during last 10 year (-0.4%), however data science teams predict its value will be better 3% in 2018 (Positioningmag, 2018). This economy situation can be another cause to motivate entrepreneurs concern and adjust their business for surviving with data analysis. Furthermore, the approach is a broader undertaking that consumer loyalty is decreasing continuously. It is the fact that consumer has many alternatives when he decides to buy or not buy any brand. The purpose of this paper is to study marketing analysis in term of location based has influenced consumer behavior in local convenient store with data analysis.

Review of Literature

The study of consumer behavior is regarding of selection, purchasing, consuming, and disposing activities (Solomon, 2013). Kumar and Kapoor (2014) studied about buying behavior of the consumers was assessed on the basis of quantity of purchase, frequency of purchase, and preferred location of the retail stores impact to the consumer decision making. While as, the closer the consumers are to a store, the greater their likelihood to buy from that store. In contrast, the

farther away consumers are from a store, the lesser opportunities to buy (Loudon & Della Bitta, 1993). The travelling time to a store is assumed to measure the effort, both physical and psychological, to reach a retail store. However, the effect of travelling time is depended on the type of product (Runyon & Stewart, 1987; Hawkins et al., 1998). For example, accessible easily store is mattered for the convenient product on the other hand, distance is not the problem for the exclusive product or service.

The Evolution of Data

The evolution of big data began with Fredrick Winslow Taylor and the scientific management techniques of the early 1900s with his world famous work "*The Principles of Scientific Management*" (Winslow, 1911). Brinton (1917) introduced data visualization, which serves as a precursor to more modern data analytics and dashboards. Later, database management techniques, data collection, data extraction, and data analysis technologies to make sense of large data (Chaurhuri et al., 2011; Turban et al., 2008; Watson & Wixom, 2007). Big data is the flexible term associated with the collection and analysis of "*large*" data sets (Bumblauskas et al., 2017). Many scholars mentioned in the same context that technology advancement is the key element to drive and develop data processing and analyzing.

Cliquet (2006) described the comprehensive definition and description like "*a collection of techniques enabling the manipulation of geocoded data, it can help in analysis more than in the conception of strategies and even less in decision-making*". Furthermore, Yrigoyen (2003) considers geo marketing as a powerful marketing tool which helps decision makers to solve some critical issues.

The emerging trend in big data is accompanied by an increase in the need of a global model or roadmap to assist IT departments not only in implementing a big data project but also in making the best use of it to meet business objectives. As a basic types of data, it explore two types of data are transactional data that is used to exchange of purchasing, after the transaction records, a business can generate is grouped together and identified as structured data or relational structure. On the other data are generated around the event of a transaction, namely; peripheral data set incidental data or non-transactional data, if it had no structure, it would be unstructured data. Furthermore, incidental data may be stored for periods of time, it does not immediately posse's value like transaction data does and it rarely analyzed same as structured data, however incident data has potential value when it is collected and processed before realizing value. For example, an

entrepreneur hope to understand how consumer interacts with the brand, he ought to analyzing incident data and pursuing the strategies for attracting new customers. Therefore both transaction and incident data can create the value of the business (Liebowitz, 2013).

Table 1 Types of data

Transaction data	Incident data
Structured data, Relational data	Unstructured data, Peripheral data
Logical and valued	Store, and analyze process before

Source Liebowitz (2013)

Ideology of Data

Data is an intangible asset or intellectual property. In 1800s, the Data Management Body of Knowledge (DAMA-DMBOK) defined data management concept that "*Data management is the development, execution and supervision of plans, policies, programs and practices that control, protect, deliver and enhance the value of data and information assets*". Over the past 20 years, the era of big data enormous expanded in various sectors. Big data analytics transformed the way marketing is conducted today (Erevelles et al., 2015). In addition, Gartner reckons that in the future big data will simply be the norm in the future and taken for granted (Sicular, 2013). Consumer has become a starter and main driver of the transaction is the potential usefulness of its big data related to consumer behavior. Big data gained momentum in the early 2000s. Big data technologies describe a new generation of technologies and architectures designed to economically extract value from very large volumes of a wide variety of data, by enabling high-velocity capture, discovery, and/ or analysis (Gantz & Reinsel, 2011).

Gartner and Laney (2011) *articulated the definition of Big Data are 3V: volume, velocity, and variety* and correspondingly with International Data Corporation in 2011 cited that "*Big data technologies describe a new generation of technology and architectures designed to economically extract value from very large volumes (into petabyte volumes) of a wide variety of data, by enabling high-velocity capture (streaming data), discovery, and/ or analysis*" (Gantz & Reinsel, 2011; Laney, 2011). Furthermore, the continuum of data either small or big data are relied into volume of data can measure into terabyte, petabyte, exabyte, and zettabyte range. Variety of data can classified into structured, unstructured, and semi – structured, and velocity of data can categories into batch, real time and flow.

Khade (2016) cited that Big data is a collection of unstructured data that has very large volume, comes from variety of sources such as website, survey, social media, chat forums, Twitter trends, Facebook, academic publication, and so on. It is embed in different formats with a great velocity which makes processing and analyzing database management tools. Data analytics is indicated the study of existing data to research about potential perspective consumers and marketing trends, and to analyze the business situation, including the consumer behavior. The biggest challenge is how to discover all the hidden information through the huge amount of data collected from the variety of sources.

Traditional market research generally involves surveys, mall-intercept interviews, and focus groups. Big Data examines what people say about what they have done or will do. Not only tracking what people are *actually* doing, but also predicting what the emerging trends in the future. It is only Big Data's capacity for dealing with vast quantities of real-time unstructured data that makes this valuable (Rayport, 2012).

Ahmed et al. (2017) referred that there are 4 characteristics related to Big Data are: value: the usefulness of data in making decisions, variability: data flows can be highly inconsistent with periodic, complexity: interconnectedness and interdependence in data structures, and veracity: data reliability (Kaisler et al., 2013; Katal et al., 2013).

Many organizations agreed that nowadays data is the valuable source of intellectual property, which lead the key to success especially digital data, is very rapidly dispersion. Laney (2001) and Monnappa (2018) stated the definition of big data, which industry used it, and the person who work with it in table 2 as bellowed.

Table 2 Description of Big Data

Big data	Industry	Big data specialist
It can be used to analyze information, customer insights which it leads to better decision and business or marketing strategy.	Financial ***Retailing*** Banking Communication Networking	Analytical skill Creativity Mathematics Statistical Computer science

Source Monnappa (2018)

Data science is a field that comprises of everything that related data cleansing, data preparation, and data analysis. Data Analytics involves automating insights into a certain database and data aggregation procedures (Monnappa, 2018).

From Table 2, there are many industries that took advantage of big data analysis such as banking, finance, communication, and networking, this study specified in retailing industry analyzed big data in getting a comprehensive understanding of the market, products, customers, competitors, and locations (Mousannif et al., 2016). Retailing industry growth is fueled by advances in disruptive technology especially innovation creation in store such as promotion announcement, payment method, e-invoice, product arrangement, shelf talker, etc. for flexibility and cost effectiveness. It is in fact that the powerful value of big data in capture, storage, processing, and analysis that it is related with the predictive analytics by using consumer data – driven business is obvious challenge of predictive consumer behavior in the future. In addition, advancement technology, artificial intelligence, virtual worker, internet of things, or automotive robotic growing relevance of the data analysis team and data science allow for an increasing competitiveness of the business, including retailing sector in emerging disruptive economy.

Enter in the 21st century; digital economy and highly competition will be the key determining factor in store success or failure. The most effective businesses will be those which recognize the crucial role of adaptation. One of the most challenging for customer satisfaction will be figuring out what the customer want.

Big data is an interesting topic. Big data has been conceptualized as the combination of volume (a large quantity of data), variety (multiple types of data, data from different source), and velocity (the speed at which data created, the real time data) (Stoicescu, 2015). Big data can be described that not only the analysis of vast amounts of information, but also the ability to reveal the meaning of hidden insights and black box buyer. In the context of local marketing, store manager or entrepreneur ought to analyze customer data from previous purchasing either regular customer or new customer in order to predict the future purchasing.

Methodology

The data population was collected from customers in local modern trade store (infinite population) as transaction data. This research chose Phuket and Ratchaburi province because there are many local modern trade stores in these two provinces. Infinite population as transaction

data from table 1 in retailing industry from table 2. In determining the sample from an infinite population, the formula by Cochran (1977) below is used:

$$n = \frac{Z^2 \boldsymbol{\pi} (1-\boldsymbol{\pi})}{e^2} = 384$$

Data were collected utilizing non- probability sampling by convenience sampling and 416 people were selected as samples from Cochran. The computed sample size is 384 and the sample collected is adequate and greater than the estimated size.

The sample used in the study was customers from six local convenient stores in Phuket and Ratchaburi. Tools in research were both quantitative via questionnaire and qualitative through in-depth interview. Factor analysis was discipline statistics run to examine differences by location factors male and female customers over 15 years old. A large-scale survey 416 respondents serves as the study setting.

Tools in research was questionnaire (quantitative method) and cross-check in depth interview with assistant store manager or store manager (qualitative method) to double check in the consumer behavior in term of the reason(s) for purchasing, the top sales of product, the frequency, the prime time, and the appropriately volume of product per transaction. The results of the in-depth interviewing is same as the survey. The multi questionnaire examined the marketing factors and the satisfaction of male and female customer do relate with their decision making, and also in-depth interviews with local store manager for confirmation.

Research Result

The study was a cross –sectional survey and the data were taken from questionnaires. The study took place in six local modern trades in Phuket and Rathchaburi provinces.

Table 3 Customer Respondents by behavior segmentation in Ratchaburi

Store	Reason	Type of product	Prime time/Location	Amount (baht)	Frequency
A	Convenience, open 24 hours (30%)	Food product (92%)	Week day (after 6.00 p.m.) near school (29%)	51- 100 (30%)	over 3 times: w
B	Variety of product, service (30%)	Consumption Product (84%)	Week day (after 6.00 p.m.) near community (29%)	101-300 (49%)	1-2 times: w
C	Variety of product, service (21%)	Consumption product (78%)	Weekend (12.00 - 2.00 p.m.) near factory and dormitory (30%)	301-500 (67%)	1-2 times: m

Table 4 Customer Respondents by behavior segmentation in Phuket

Store	Reason	Type of product	Prime time/Location	Amount (baht)	Frequency
D	Convenience, open 24 hours (31%)	Food product (97%)	Week day (after 6.00 p.m.)/ near school (19%)	101- 300: Transaction (38%)	over 3 times: w (28%)
E	Variety of product, service (34%)	Consumption Product (91%)	Week day (after 6.00 p.m.)/ near community (38%)	101-300: Transaction (28%)	1-2 time: w (34%)
F	Convenient Transportation (61%)	Consumption product (83%)	Week day (after 6.00 p.m.)/ near hotel, and tourism location (28%)	501- 700 : Transaction (31%)	1 time: m (34%)

As shown in Table 3 and 4 a large group of respondents were strong represented in the location is determined the type of consumer and type of product that consumer will buy as the following: the store near the educational institution mostly consumer are students, teacher, and officer. They would like to buy the consumption product because of its convenience. Whiles, the store near community mostly consumer are resident. They would like to buy the consumption product in evening because it is the passage way to their accommodations. Moreover, the stores near the workplace, factory, or tourism location had most consumers as workers, officer, or tourist that each purchasing transaction is more high volume than other locations. Be comparing consumer behavior in Phuket and Rachaburi province, it can be found that consumer behavior in each location differ. These data can have tested for confirmation in two provinces and interviewed with store

managers again for affirmation. However, consumer behavior data have to be doubled checked using the same condition for predictive model designing in the future.

Discussion

Analyzing data can create the marketing strategies including stimuli and response theory (S-R Theory) (Solomon, 2009) to accelerated purchasing either sales promotion, product ordering, or even new product development, or local product (one tampon one product) for each community in Thailand like many convenient stores work on these valuable big data.

Especially, consumer lifestyle and activity in each day has the strong relationship with consumer purchasing from this survey, hence it is the fact that marketing factors are also significant with consumer decision making. Initial, product dimension is the quality as the most matter always, and category product arrangement is the other issues concerning, the price dimension regard on the sign of price is the thing that made consumer clear before purchasing, promotion dimension focuses on the seller with assistance, and continuous selling promotion setting can appeal both regular and new consumer as well. Other factors about experimental customer are effective on the trial free product with some type of sensitive product.

Whiles, customer behavior dominates customer recognition, information search, alternatives selection, types of purchasing, and post evaluation. It depends on each community and culture context. The story of customer journey indicates the lifestyle, preferences, attitude, including decision-making. Hence, the entrepreneur ought to track, analyze, and applied these powerful of data to create marketing strategy in term of product development, pricing strategy, promotion selection, and model of delivery, or payment, etc.

Moreover, geo marketing or marketing geography is the tool that marketer incorporated geographic information in the process of marketing activities. It can use in location intelligence to reach the right customer at the right time. Customer location data is used as part of marketing strategy. The capability of geo marketing goes the real time. It is useful to deliver mobile coupon to create digital mapping to display location by the tracking and user's IP address to know who you are, what you buy, where, when, how, and why you buy based on the location for the existing customers, and new customers. We use its data about local marketing suit with each local store, for example: some stores location show the demand of popular product such as OTOP (one sub-distract on one product) is a local unique product of each Thai district (tambon) such as silk garment, handcraft and so on. Some stores order local product as local souvenir for tourists. Some

stores create marketing campaign or sales promotion suits with traffic or resident areas. Some stores decorate interior design suits with local culture and customer lifestyle. These survey results found out that geo marketing provides the track and method for analyzing the location of target consumers to achieve the profitability and sales volume.

Latour and Le Floc'h (2001) defined geo marketing as a system composed of data, IT data-handling programs, statistical methods and graphical representations which is designed to produce useful information for decision-making through tools that combine digital cartography, graphs and tables. Geo marketing system is the marketing tool that it is depended on the local market and purchasing power depend on demographic characteristics within the store area (Grewal et al. 1999). Baviera-Puig et al. (2016) concluded their research that socio - demographic characteristics of the supermarket's trade area affect business' location strategies that it can design store profile, location strategies according to store features, competitors and environment.

Future Recommendations with Emerging Trends

Nowadays, high competitive business is continuous increasingly, many entrepreneurs tried to shift from transactional to customer-centric instead. High competitiveness in retailing business will drive many local convenience stores by putting affordability to super convenient store

1. First trend, how is super of **Super Convenient Store**? (Retail Academy, 2013). We try to search for new product or innovative product stand in store and add more self-service counter or e-service, such as online pick up at store, or online for home delivery, or even curb-side pickup, which is now very popular new service for Amazon fresh food. Furthermore, new trends evolved, such as the "Super convenience store" that is about adding more variety of products especially the ready to eat foods with self-service, and the creation of service like the "Click and Collect," which is about ordering online but pick up at the store.

2. **Store profile** has developed to Automatic store, or Smart store in many processes such as stock checking, product arrangement, shelf talking, price scanning, or mobile payment. Technology enables customer to become more attracted in their shopping location, let marketer understand more customer behavior in real life.

1) **Beacon technology** support marketer see how search advertisement and local advertisement affect in store visiting. It connect Bluetooth low energy to action when close to the store, it can track customers' on social media.

2) **Facial recognition** describes biometric technology to identify individual, it collects data base of demographical customer, and how they behave when they shop in store for marketing recording.

3) **Robot assistance** in store bring intelligent customer of big data to provide smart service in store, it can handle scenario from repeat customer inquiry to complex recommendations, and it can interact with live data.

3. **Smart mirror, smart cart, smart shelf** or magic mirror, magic cart, magic shelf connect Wi-Fi that customer can test the product by themselves.

4. **Hypermarket** changes store profile into small size because of customer behavior transformation. They prefer to shop in several small store trip daily rather than pay with big shopping trip a week.

5. **Mobile store** car is another popular store profile because of flexibility and cost effectiveness.

Conclusion

Forecasting consumer behavior is realized through advanced technology and big data merging with geo marketing analytics. Understanding what consumer decision - making, consumer insight, it leads to revolutionize marketing strategies and implement marketing activities through marketing mix: product, price, place, and promotion effectively.

It is interesting to note that respondents' answers show the strongest location factor influence with consumer purchasing about the details in each transactions as type of consumer, type of product or service, volume of purchasing, and it is included a high positive opinion of consumer regarding on the convenience and variety of products or services when they decide to shop at the local convenience store. It also indicates the result that marketing factors are product quality, sign of price; category product arrangement, personal selling, and sales promotion dimension are the essential factors influencing the consumer decision - making respectively. Moreover, the researcher had a good opportunity to interview store managers. The interview results also confirmed that the data of consumer behavior in terms of frequency, duration, volume, location, and type of product is very crucial data to strategy planning and marketing activity designing as well. However, these findings from the study are limited to some extent in terms of geographic and cultural factors including location in neighboring areas in two provinces, therefore, it cannot be generalized. Although these data have the potential to further consumer understanding in each

status; pre-purchasing, purchasing, and post-purchasing. In order to formulate a predictive model building, another method that can be used is to double check the results of this study. In order to formulate a predictive model building, another method can be used is to double - check the results of this study. Nevertheless, limitation in culture in each community is unique, and different from others, therefore, data analysis should be concerned about norms and traditions of specific group of customers in certain areas.

Finally, the entrepreneurs have used factor analysis instrument to measure each dimension impacts to consumer decision making and they do recognize on the importance of big data for predictive behavior in the future and the questionnaire results show that each local store ought to adapt its store, product and service assortment, price setting, promotion tool, and others suits with regular consumer in community. The findings suggest that in developing the product and service quality, emphasis should be focused on local store marketing. Furthermore, geo marketing is the tool that marketer incorporated location intelligence to add more value in the business to response customer satisfaction in the appropriated and real time. However, this study is depended on the demographic and cultural factors of each location. Finally, location has significant impacted to each store profile, and marketing strategies.

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