

## USING AHP TO QUANTIFY DECISION FACTORS FOR SELECTING A FOOD DELIVERY SERVICE PROVIDER

### การใช้วิธีวิเคราะห์ตามลำดับชั้นเพื่อประเมินปัจจัยสำหรับการตัดสินใจ เลือกผู้ให้บริการจัดส่งอาหาร

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#### **Abstract**

The life pattern of people in modern society has changed due to the advancement in information and telecommunication technology. Wide use of mobile internet and applications is one of the major drivers for online food order and delivery service industry. This research investigates the decision factors affecting the selection of food delivery service providers by using analytical hierarchy process. It has been founded that availability of service providers, accuracy of order, innovation of services, and service people's attitude are the key influential decision factors. It is recommended that food delivery service providers should not only maintain the key service performance standards but also implement more innovative services. Example of innovative tool in delivery service is also suggested.

**Keywords:** Food delivery service provider, Online food order, Customer service, Service innovation, AHP

#### **บทคัดย่อ**

รูปแบบการใช้ชีวิตในสังคมยุคปัจจุบันได้เปลี่ยนแปลงไปเนื่องจากความล้ำหน้าของเทคโนโลยีข้อมูล ข่าวสารและการสื่อสารโทรคมนาคม การใช้อินเทอร์เน็ตรวมถึงแอปพลิเคชันบนเครื่องมือสื่อสารแบบพกพาอย่างแพร่หลายเป็นแรงผลักสำคัญของอุตสาหกรรมการให้บริการจัดส่งและการจัดการคำสั่งซื้ออาหารแบบออนไลน์ งานวิจัยนี้มุ่งเน้นการระบุและวัดความสำคัญของปัจจัยที่มีผลต่อการตัดสินใจเลือกผู้ให้บริการจัดส่งอาหาร ด้วยวิธีวิเคราะห์ตามลำดับชั้น ผลการวิจัยพบว่า ปัจจัยที่มีผลต่อการตัดสินใจประกอบด้วยความพร้อมให้บริการ

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ความถูกต้องสมบูรณ์ของคำสั่งซื้อ นวัตกรรมบริการ และทัศนคติของผู้ให้บริการ โดยมีข้อเสนอแนะว่า ผู้ให้บริการจัดส่งอาหารควรจะรักษามาตรฐานการให้บริการควบคู่ไปกับการพัฒนานวัตกรรมใหม่ๆ สำหรับการให้บริการ รวมถึงได้เสนอแนะตัวอย่างการใช้เครื่องมือเชิงนวัตกรรมสำหรับบริการจัดส่ง

**คำสำคัญ:** ผู้ให้บริการจัดส่งอาหาร การสั่งซื้ออาหารออนไลน์ การบริการลูกค้า นวัตกรรมบริการ วิธีวิเคราะห์ตามลำดับชั้น

## Introduction

Information and communication technology have become part of people daily life since the rise of internet and electronic commerce. People use mobile Internet and mobile applications for online transactions such as banking, paying bill, booking movie and concert, making reservation at restaurant, checking in for air transportation, and ordering food. Fast food restaurant chain like Kentucky Fried Chicken is one of the very first restaurants in Thailand that offer online order and delivery service. In the past few years, newborn service providers have launched mobile websites and mobile applications offering delivery service for food. In the meantime, many standalone restaurants set up their own delivery systems, or cooperate with local motorcycle taxi, so that they do not have to rely on service by third party. Similar pattern also exists in Malaysia (Yeo, Goh & Razaei, 2017).

The change in city life style has become one of the drivers for online food order in several countries, including Thailand. With increasing number of users of Internet and smart devices, the food delivery service providers earned more users. At the same time, the battle

between delivery service providers has become more and more competitive. The question is, apart from classic key decision factors like price, quality and time, what else influence customers' decision to choose a certain service provider. Therefore, the researcher aims to measure service factors as well as technology factors for selecting food delivery service provider in Thailand by using analytical hierarchy process (AHP). Service delivery, service process, service people and offering technology are the evaluating components with thirteen factors at sub-component level. Price, time and quality are not included in this AHP application so that other service factors can be quantified.

## Research Objectives

This paper examined the relevant technological issues associated with food delivery service providing as well as evaluated factors affecting the decision to select food delivery service providers in Thailand.

## Literature Review

### 1. Relevant Decision Factors

Tracey (1998) has quantified the magnitude of logistics efficiency to customer service

and performance of firms. Associated factors were price, quality, and time. Four criteria for customer value's evaluation on express delivery service were indicated by Ding et al. (2016). The described criteria were service, cost, time, and quality. Additionally, the research conducted by Ghajargar, Zenezini & Montanaro (2016) indicated customers based their choice of home delivery service providers on service providers' date and time availability as well as quality. They also preferred slower service with less cost rather than flexibility and reliability.

Logistics services were measured and analyzed in many ways. Collins, Henchion, & O'Reilly (2001) and Kisperska-Moroň (2005) explored logistics customer service in different country. Bottani & Rizzi (2006) used quality function deployment (QFD) to propose strategic management of logistics service. Later, QFD was also applied by Lin & Pekkarinen (2011) to identify customer requirements for logistics service design in three layers: service, process, and activity. Ramanathan (2010) used regression analysis to evaluate risk and efficiency influenced on the relationship between logistics and customer loyalty. Melović et al. (2015) explored the most common components in customer service under logistics and engineering management context, which are delivery time, quality of delivery, after-sale service, customer notification, price of product, accuracy, and accessibility. Yu et al. (2015) used structural equation model (SEM) to quantify relationship between technology, flexibility, knowledge, soft and hard infrastructure, and customer

satisfaction on product delivery service provider selection in China. Lan et al. (2016) evaluated customer satisfaction for logistics service by using fuzzy AHP. It has been found that communication and accuracy are among the significant factors that impact customer satisfaction. Limbourg, Giang & Cools (2016) also carried out a research on logistics service quality in the city of Da Nang, Vietnam by using SERVQUAL model.

As for innovation and technology context, Kaňovská & Tomášková (2015) identified innovation as one of the crucial trends in customer services and interfunctional coordination of Czech manufacturers. McFarlane, Giannikas & Lu (2016) developed a conceptual model for customer-oriented intelligent logistics in which intelligent logistics activities are subjected to have several properties under closeness to customer, flexibility, and accessibility. Xu, Munson & Zeng (2017) assessed the influence of electronic service offerings on online customer rating and demand in China by collecting data through Taobao, which is a Chinese leading online shopping website.

According to Schumann, Wunderlich & Wangenheim (2012), technology mediated service can be categorized into two major groups: self-services and delivered services. The nature of delivery service is a physical distribution. However, customers can complete their orders online all by themselves, making the order placement a self-service. Therefore, the most challenging issues are the usability of the website and mobile application as well as

the standardized process.

Ryu & Lee (2018) proposed a hypothesis stating that using technology will enhance positive effect on service creation, service delivery, and customer interaction. The hypothesis was later proved that only service creation and service delivery were positively influenced by using technology.

This paper focused on quantifying other relative factors associated with service marketing mix (Gemmel, Van Looy & Van Dierdonck, 2013), service creation and service delivery based on the hypothesis of Ryu & Lee (2018), and other technological issues. Total of 13 relative decision factors were extracted from the literatures, as presented in Table 1.

**Table 1** Decision factors obtained from literature review

| Literature                               | Decision Factors |    |    |    |    |    |    |    |    |    |    |    |    |
|--|------------------|----|----|----|----|----|----|----|----|----|----|----|----|
|  | Ac               | Ag | At | Av | Co | Fe | In | Nw | Re | Se | Sk | Uf | Vi |
| Collins, Henchion & O'Reilly (2001)      | *                | *  |    | *  |    | *  |    |    |    |    | *  |    |    |
| Kisperska-Moróñ (2005)                   | *                | *  |    | *  |    |    |    |    |    |    |    |    |    |
| Bottani & Rizzi (2006)                   | *                | *  |    | *  | *  |    |    |    |    |    |    |    |    |
| Ramanathan (2010)                        |                  |    | *  |    | *  |    |    |    |    |    | *  |    |    |
| Lin & Pekkarinen (2011)                  | *                |    | *  |    |    |    |    |    |    |    |    |    |    |
| Schumann, Wunderlich & Wangenheim (2012) |                  |    |    |    |    |    |    |    |    | *  |    |    | *  |
| Melović et al. (2015)                    | *                | *  |    |    |    |    |    |    | *  |    | *  |    | *  |
| Yu et al. (2015)                         | *                | *  |    | *  |    |    |    | *  | *  | *  | *  |    | *  |
| Ghajargar, Zenezini & Montanaro (2016)   | *                | *  |    |    |    |    |    |    | *  |    |    |    | *  |
| Lan et al. (2016)                        | *                | *  |    | *  | *  |    |    | *  | *  | *  |    |    |    |
| Limbourg, Giang & Cools (2016)           | *                | *  | *  | *  | *  |    |    |    | *  |    | *  | *  | *  |
| McFarlane, Giannikas & Lu (2016)         |                  |    |    |    |    |    |    |    | *  |    |    |    | *  |
| Xu, Munson & Zeng (2017)                 |                  |    |    |    | *  | *  |    |    |    |    | *  |    |    |
| Total factors mentioned                  | 9                | 8  | 3  | 7  | 6  | 4  | 2  | 5  | 2  | 6  | 3  | 2  | 2  |

Explanation of each decision factor can be described as follows. *Accuracy (Ac)*: precision of order information, including correct specification, quantity, price, and premise.

*Agility (Ag)*: the service provider can handle sudden change in order, including delivery details, delivery scheduling adjustment, and last-minute order modification.

*Attitude (At)*: the behavior and the manner of service staff while giving the service. This includes when the service staff response to complaints and give information in online channel.

*Availability (Av)*: the service provider is ready to deliver once the customer place the order, and has sufficient resources including staff, equipment and vehicles.

*Communication (Co)*: communication channels are offered by the service provider so that the customer can send feedback and file for claim, return or refund conveniently.

*Features (Fe)*: Information technology; including websites, mobile websites, and mobile applications, are available and equipped with appropriate features.

*Innovation (In)*: the service provider offers innovative service from time to time.

*Network (Nw)*: the service provider has comprehensive service network (or service radius).

*Reliability (Re)*: the information technology, including websites, mobile websites, and mobile applications, are stable and well maintained. The customer does not frequently encounter downtime or unexpected logged out.

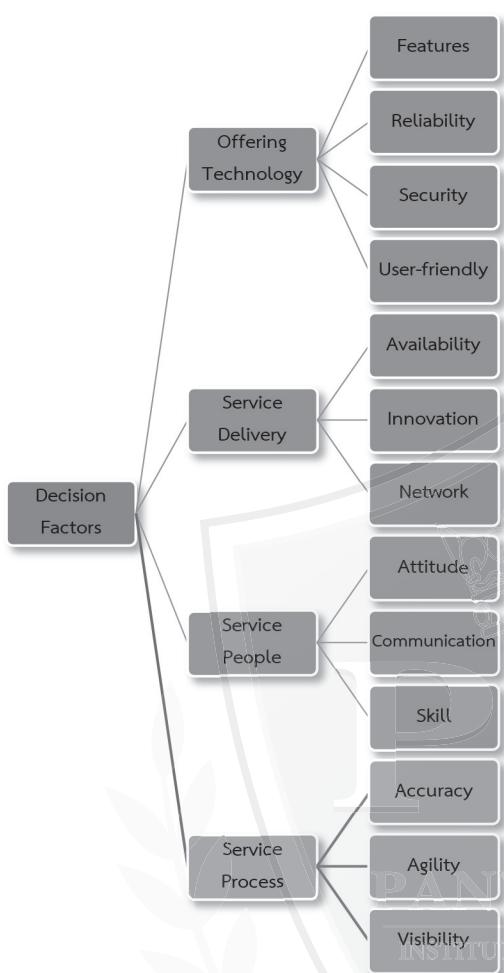
*Security (Se)*: the website and mobile application are equipped with security measures (for example, one-time passcode and security questions) so that customer payment information such as credit card and electronic money account are protected from hackers and cyber threats.

*Skill (Sk)*: the service people have skills and knowledge to provide service.

*User-friendly (Uf)*: the information technology, websites, mobile websites, and mobile applications, are easy to use and navigate even for the first-time user.

*Visibility (Vi)*: service information is clearly displayed in the websites and applications. Customers can access their account and track their orders in the real time manner.

The decision factors are categorized into four groups: offering technology, service delivery, service people, and service process, as illustrated in Figure 1.



**Figure 1** Factor Grouping

Source: Author

## 2. Methodologies

In this research, a survey was conducted in two ways. The first one is a survey to confirm that decision factors extracted from literature review exist and are influencing the customer's decision making. After completing the analysis of the collected data, AHP questionnaires were distributed.

AHP was introduced by Saaty (1980). The approach has been used in a wide range of logistics research including delivery service

and logistics service. Apart from Lan et al. (2016) who applied fuzzy AHP to measure customer satisfaction in logistics service, Gürcan et al. (2016) also demonstrated the 3PL selection by using AHP. Similarly, Peng (2012) used AHP for choosing logistics outsourcing service suppliers.

## Results

### 1. Survey

The Target respondents of the survey were general users of food delivery service. The questionnaire were distributed online for the user in Bangkok, which is the largest market of food delivery service industry. A total number of 1,255 responses were received. Fifty-four percent of responses were female. Approximately 70% of respondents are between 18 and 24 years old. The usage of technology to order food was well distributed, with 37%, 31%, and 31% for the usage of website, mobile application, and phone calls, respectively. About 60% of customer order food from restaurant with in-house delivery unit, while the remaining 40% are customers of food delivery service providers.

Despite being the only food service provider who offer service through mobile application alone in this survey, Line Man is the dominant player in the food delivery service industry, with usage of 30.7% followed by Foodpanda and Wongnai, with usage of 9.2% and 2.9%, respectively.

By further analyze the data, 44% of mobile application users order their food through

Line Man, 24% through restaurants with in-house delivery unit, 17% through Foodpanda, and 6% through UberEATs. As for internet users, 77% placed their orders through restaurants with in-house delivery unit, 9% through Foodpanda, and 5% through UberEATs.

Twenty-two percent of respondents used food delivery service only two to three times a year. However, 20% and 18% used food delivery service once a month and two to three times a month, respectively. Among all service providers, Line Man is the only service provider that some respondents use every day.

Issues concerning the food delivery service providers were categorized into three groups: key performance indicator (KPI) issues; technological issues; and other service issues. The results from survey are summarized in Table 2.

For KPI issues, customers concern the most on delivery delay. Service rate is also another major concern. Except for UberEATs and Foodpanda who offers flat rate service fee, customers of the other food delivery service provider faced uncertain service rate issue, especially with motorcycle taxi that does not charge the fee in standardized rate.

**Table 2** Service issues summary

| Key performance indicator issues                      | Other service issues  |
|---|---|
| Delivery delay (Time) 61.0%                           | Limited service zone 42.5%  |
| Unstandardized service rate (Price) 33.3%             | Deliverer is not ready to give service 14.7%                                |
| Product damage in-transit (Quality) 5.7%              | Inaccurate order 13.5%  |
| INSTITUTE OF MANAGEMENT                               |   |
| Technological issues                                  |   |
| Unstable website/mobile application system 37.2%      | Unable to track delivery status 13.5%                                       |
| Unattractive website/mobile application 23.8%         | Unable to modify purchase order 7.3%  |
| Website/mobile application is not user-friendly 22.4% | Service staff is not friendly or lack of interest in providing service 3.6% |
| Unsafe online transaction 16.6%                       | Inexperience or unskilled service staff 1.9%                                |
|   | Service rate and related information are not clearly displayed 1.7%         |
|   | Insufficient communication channel 1.3%                                     |

The largest other service issue is the limitation in service distance, in which 42.5% of customers consider this shortcoming seriously. Three additional issues; readiness of service provider, order accuracy, and order visibility were also major concerns with 14.7%, 13.5%

and 13.5% rating respectively.

## 2. AHP

The data collection for AHP survey was conducted in January 2018 via several focus groups which held in Bangkok, Thailand. Target

respondents are customers who use food delivery service provider. These customers live in Bangkok and Metropolitan area and has experienced with food delivery service system on either mobile application or internet platform. All collected responses were tested for their consistency, which consistency ratio (CR) must not exceed 0.100. Total of 194 usable responses were derived. The average CR was 0.038; making the AHP application appropriate.

Under AHP, pairwise comparisons between two factors within the same dimension were applied based on 1-9 scale (Saaty, 1980). There

were total of 21 pairwise comparisons in this AHP model. AHP results are displayed in Table 3.

At the component level, service delivery is the leading component. There is a very slight weight difference between offering technology and service people, which mean they are equally important.

Within the offering technology component, reliability is the leading factor. This coincides with the survey results in Table 2 that customers concern most about the stability of the website and mobile application.

**Table 3** AHP results

| Decision Factors    | Weight  | Local     |             | Global  |      |
|---------------------|---------|-----------|-------------|---------|------|
|                     |         | Component | Rank Factor | Weight  | Rank |
| Offering Technology | 0.20441 | 3         |             |         |      |
| Features            | 0.26638 |           | 2           | 0.05446 | 10   |
| Reliability         | 0.35418 |           | 1           | 0.05993 | 8    |
| Security            | 0.18425 |           | 4           | 0.04478 | 13   |
| User-friendly       | 0.20703 |           | 3           | 0.04521 | 12   |
| Service Delivery    | 0.37019 | 1         |             |         |      |
| Availability        | 0.46924 |           | 1           | 0.18734 | 1    |
| Innovation          | 0.28379 |           | 2           | 0.09979 | 3    |
| Network             | 0.24309 |           | 3           | 0.08220 | 5    |
| Service People      | 0.20439 | 4         |             |         |      |
| Attitude            | 0.47187 |           | 1           | 0.09012 | 4    |
| Communication       | 0.30794 |           | 2           | 0.06284 | 6    |
| Skill               | 0.22019 |           | 3           | 0.04938 | 11   |
| Service Process     | 0.22313 | 2         |             |         |      |
| Accuracy            | 0.47150 |           | 1           | 0.10071 | 2    |
| Agility             | 0.27131 |           | 2           | 0.06218 | 7    |
| Visibility          | 0.26343 |           | 3           | 0.05916 | 9    |

The second influential factor in the component is features. Although all of service provider has their own websites and mobile applications, this factor revealed that having only website and application is not enough. Service providers have to offer the website and application equipped with sufficient features for placing order, tracking order, and communicating with delivery staff. User-friendly ranked the third in this component. Since most respondents are young people who are familiar with information technology, use of internet and smart devices, they have no problem using the website and application to place order for food. Security is the least influential factor in this component. One of reason that customers do not concern much about safety in online transaction because most of them pay cash and the market dominant, Line Man, does not accept credit card, e-money, or bank transfer for payment. Another reason is that the website and application do not request a lot of information to order food online. With minimal information given to service provider, customers feel safer to use the website and application to place order.

For service delivery component, availability is the most influential decision factor. This factor is also the most influential factor when comparing all thirteen factors together. This means whenever customer place order, service provider must arrange for delivery immediately, otherwise the customer will turn to other service provider. Innovation as the second leading factor in the component shows that customers are looking for and tending to select

service provider with innovative service. The least influential factor in this component is network, which differ from the survey result in Table 2. This is explainable since the sampling for the first survey is general customer for both restaurants with in-house delivery unit and food delivery service providers, while the AHP result was derived from the latter. Customers of food delivery service provider are usually aware of the service zone. Additionally, more than 60% of respondents use Line Man which do not restrict the delivery distance.

Attitude is the leading factor in service people component. When customers give substantially high weight to this factor, it means that they are expecting the service staff to be polite and serve them with passion. This factor is related to communication, the second most influential factor in this component, because the service staff is responsible for communication with customer. The service staff must be ready to give information, take complaints, and fix issues with proper manner. The least influential factor is skill. Since most of the work in food delivery service are completed beyond customer acknowledgement, they do not consider skill as important as attitude and communication. In addition, customers view delivery service as a job that does not required specific or high-level skill when compare with other type of service.

Within service process component, accuracy is the leading factor with significant weight when compare with the other factors.

Customers judge their expectation of service on how fast they get the product, what product they receive, how much they have to pay, and how good is the product. Accuracy plays significant role in getting all elements correct. Customers will be disappointed when they get what they did not order, or when they have to pay more than they were previously notified. Agility, which reflects service providers' responsiveness and flexibility, is the second influential factor, follow closely with visibility. Both factors showed that customers can always change their mind and want to track their orders even though the orders should be completed and delivered within less than an hour.

### Recommendations for Business

Overall, with availability and accuracy being the first and second most influential decision factors, food delivery service providers do not only have to maintain their service standard but also plan for unexpected demands. Service providers must have enough fleet and delivery staff to accommodate all orders.

Innovation is also one of the key decision factors. With internet and technology integration, food delivery service has already offered interactive website and mobile application for order placement. The next step is innovative delivery. Amazon.com has taken further step by implementing the conceptual Amazon Prime Air, a delivery service using unmanned aerial vehicles (UAVs) or drones. Giones & Brem (2017) also suggested use of drone as an innovative service tool for large

cargo logistics and small package delivery. Olivares et al. (2015) also mentioned the use of drone in modeling internal logistics for product assembly. Since Commercial drones can travel up to 100 miles per hour and accommodate the good under five pounds (2.3 kilograms), they are perfect for food and other light weight package delivery. However, application of drones in product delivery encountered several issues including legal and airspace. Currently, the use of drone in Thailand is very limited and there are restricted areas in which drones are not allowed to fly by or passed over. Therefore, delivery route optimization and planning should be carefully integrated with study of legal matters.

### Conclusion

By using AHP to quantify the decision factors for selecting food delivery service provider, it is obvious that Line Man proved to be the true market dominant by holds most of the decision factors. The application offers 24 hours delivery (availability), correct product delivery with promised price (accuracy), no restriction on delivery distance (network), communication channel for information inquiry, claim, and complaint (communication), order modification option (agility), stable mobile application system (reliability), tracking system for delivery man (visibility), satisfactory mobile application (features), proficient service staffs (skill), and off-line payment (security).

Staff's attitude and ease of using application are subjective. Since customer satisfactory of

mobile application can be measured through application stores in Google and iTune App stores. The service provider can use ratings and feedbacks to improve and further develop the application. Because customers are also looking for innovative services, food delivery service providers are encouraged to develop inventive services. Using drone can be one of the ground-breaking options. It should be interesting to foster research on drone usage for logistics and delivery purpose as Amazon.com has already launched Prime Air service which offers 30 minute delivery.

There are some limitations in this research. First, this research focuses on customer view for food delivery service providers. To better understand the system, service provider

view should be included. Second, some service providers, such as Grab Food, are excluded from this research. Grab Food was introduced in November 2017, after the first data collection period. Third, some factors in different components, for example, availability and agility, are interrelated. Using AHP alone cannot quantify such relationship. Hence, to further investigate the relative influence of the decision factors across components, analytical network process is recommended.

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