

## INCREASING EFFECTIVENESS OF MANAGEMENT IN FOODSERVICE SECTOR THROUGH DYNAMIC DELIVERY PRICING MODEL

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**Purpose:** Due to the COVID-19 pandemic, the foodservice sector's activities have not only been limited but have also experienced a change – increase in demand for online order and delivery of food. Thus, improving the cost-effectiveness of food delivery is not so much as recommended, as it is necessary.

**Design/methodology/approach:** The aim of this study is to propose a dynamic model of delivery valuation. Using SWOT analysis, the significance of delivery presents itself as a factor influencing competitiveness. An IDI with suppliers allowed for the identification of weaknesses in the current delivery price models. Subsequently, a dynamic price model, based on the possibility of usage of publicly accessible data, was proposed.

**Findings:** Fixed delivery costs can reduce revenues and generate losses in the event of a high fluctuation in fuel prices. Therefore, it is crucial to properly evaluate delivery costs, taking into account not only the distance, but also other variables. The key factors of delivery costs include: one-time cost for the courier's course, distance, opportunity cost of a given delivery expressed as the possibility of making another delivery defined as delivery time. It should be emphasized that it ought to be determined by the volume of traffic at a given moment.

**Originality/value:** The proposed model provides solutions for the foodservice industry, allowing for optimization of delivery costs. The implementation of the dynamic model in a new market sector can be described as an innovation, which could help not only entrepreneurs, but also customers.

**Keywords:** foodservice sector, online order, food delivery, dynamic pricing model.

**Category of the paper:** Research paper.

## 1. Introduction

The environment has always determined the organizational situation (Gollay et al., 2016), but it is the information and communication technology (ICT) and the associated social effects that have made the virtual world the basis of contemporary relations, business and commercial alike (Ejemeyovwi et al., 2021). ICT as a tool creates great opportunities that grow in relation to the number of users (Sobczyk, 2018).

As a crucial component of technological evolution, digitization has the potential to significantly accelerate development (Miśkiewicz, Wolniak, 2020; Pollák et al., 2021). By more effectively adjusting a business to market conditions and discovering potential areas for new business ventures, the use of ICT tools enhances the decision-making process (Olszak, 2016). Therefore, it can be said that the use of ICT contributes to an enterprise's success (Gajdzik, Wolniak, 2022; Olszak, 2021). Every year, the number of Internet companies related to entertainment, food delivery, shopping, education, and remote work solutions grows significantly (Donthu, Gustafsson, 2020).

This is due to the fact that in the modern world most people communicate using the Internet, while also using it to obtain information and make purchases (Kieźel, 2010, p. 242). The consumer, by means of having access to the Internet, quickly and easily identifies his own needs, looks for rational and alternative solutions, purchases products that he has a preference for, which at the same time meet his expectations (Smyczek, 2012, p. 264).

The upward trend in Internet usage has been sped up by the COVID-19 pandemic as governments in efforts to slow the spread of the virus have focused on reducing transmissions by restricting movement and access to certain sectors of the economy. One of these sectors has been the foodservice industry, which had to adapt to the newly-imposed restrictions. To reach the consumer with its product, it was necessary to optimize operations as well as to look for alternatives (Ziętara, 2022). During the COVID-19 pandemic, entrepreneurs had to quickly introduce the possibility of order delivery, while others had to prepare for an increase in the intensity of deliveries. Some of them even ceased their standard brick-and-mortar operations, fulfilling only take-out or delivery orders (Badowski, 2020). Along with the increase in the number of deliveries made by the foodservice sector, the problem of pricing the delivery is becoming more and more visible. As a result, the issue of the valuation of the cost of food supplies is more and more often discussed in the literature (MacKay, Svartbäck, Ekholm, 2022).

The delivery price is fixed or calculated based on distance. Considering distance as the sole variable for estimating the cost of delivery does not optimize the price, because in the event of increased traffic, the driver needs more time to reach the destination. Consequently, he is unable to make alternative deliveries and loses time for based on which he is compensated. Therefore, it is reasonable to look for alternative methods of evaluating delivery costs.

Deliveries are the basis of Internet activity; therefore, the pricing model is important since it determines the amount of profits in a significant manner (Asdemir, Jacob, Krishnan, 2009). Dynamic pricing models are furthermore seen as fairer as compared to fixed pricing (Narahari, Raju, Ravikumar, Shah, 2005). In addition, they are able to react to changing market conditions, and in the case of deliveries, they immediately consider information about the volume of traffic (MacKay, Svartbäck, Ekholm, 2022). Dynamic pricing models have been in use for decades (McAfee, Te Velde, 2007) - they are used in the sale of airline tickets (Burger, Fuchs, 2005) or stadium seats (Kemper, Breuer, 2016). The catering sector is different from e-commerce. First of all, food is usually consumed as soon as it is delivered. In addition, there is no maximum number of orders for the entire day, yet delivery is a limitation to that. After it is no longer available, restaurateurs disable the option of ordering food with delivery. It should be emphasized that the exhaustion of the pool of the available supply does not increase its price, which is in stark contrast to the case of purchasing online tickets (Shukla et al., 2019).

The aim of the study is to put forward a proposal for a dynamic delivery pricing model that takes into account the real-time traffic volume and uses commonly available information technology (IT) tools. Therefore, the purpose of this study is of a theoretical nature, based on a case study of the foodservice sector. In order to achieve this, the following research questions were posed:

1. Are the currently used valuation methods optimal? If not, what are the reason?
2. What affects the delivery cost? What should be the specification of the delivery pricing model?
3. What are the strengths and weaknesses of the analyzed enterprises in the foodservice industry? What are the opportunities and threats?

## **2. The foodservice industry situation caused by the COVID-19 pandemic**

The epidemiological emergency, which began at the beginning of 2020, forced enterprises to adapt to new conditions. The functioning of all industries in Poland was influenced by regulations imposed by the Minister of Health on March 13, 2020, which came to force the following day (i.e. March 14, 2020), introducing a state of epidemiological emergency. Enterprises were forced to reduce their activities overnight. The extensive duration of the pandemic and recurring restrictions meant that some sectors required government assistance to continue their operations and adapt to the new market conditions (Kubiczek, Derej, 2021). According to the data from the Central Register and Information on Economic Activity (2020), about 60,000 enterprises decided to suspend or wind up their business.

The introduced restrictions had the greatest impact on the small and medium-sized enterprise sector (Lves et al., 2020). The greatest risk is cash flow which is the result of limited and low-level income or reduction in its entirety, with the presence of constant expenses (Lu, Wu, Peng, Lu, 2020). The discussed situation was especially visible in the foodservice industry around the world (Spanulescu, Gheorghiu, 2020). The reason for that was not only government-imposed restrictions, but also the changes in conditions of functioning of the demand side.

Decision-making is a complex process, the key element of which is the situational context. The choice of a given variant may be made under the conditions of certainty, uncertainty, or risk (Holska, 2016). An extraordinary situation is decision making under the conditions of a pandemic, where concern for health is the determining factor.

The desire to distance people from each other and reduce the risk of infection has made the online shopping of food products a global trend (Guo et al., 2021). It has been proven that the desire to feel safe in case of mounting infections increased the likelihood of using the Internet to buy food products (Gao et al., 2020). Furthermore, the introduced restrictions limited consumption in gastronomic establishments, thus forcing the use of their services with personal pickup or the option of delivery to a specified address (Harms et al., 2021). It should be emphasized that the monthslong, repeated lockdown strengthened the preference for online food purchases and the use of take-away food services (Guo et al., 2021; Wang et al., 2020; Ziętara, 2022). The combination of restrictions limiting the activities of gastronomic establishments along with changes in consumer behavior resulted in a synergistic effect in the transformation of the demand for food products, increasing the demand for deliveries (Hadasik, Kubiczek, 2022).

Therefore, the COVID-19 pandemic has significantly changed the functioning of the foodservice sector in Poland (Grochowicz, 2020). Some of the companies have changed the model of their operation, and new restaurants have been created that carry out take-away or delivery orders (Badowski, 2020). The result is a significant increase in competition in the foodservice industry with this competition now, in addition to such factors as price volatility, dependence of revenues on arbitrary factors, as well as inconsistent and ever-changing tax law, a threat to maintaining and developing the business (Kantor, 2021). Therefore, there exists a need to, among other actions, gain customer loyalty and build relationships with them (Kantor, 2021).

During the COVID-19 pandemic, the main issue in the operation of the foodservice industry was to provide existing customers with the possibility of using the restaurants' services. In response to the introduced restrictions, as well as in order to maintain safety of the consumer, enterprises from the sector in question introduced several changes in their operations, such as enabling contactless payments, particularly card payments (Iwańczuk-Kaliska et al., 2021), or extending the possibility of ordering via the Internet, including the implementation of deliveries (Ziętara, 2022). However, the newly-entrenched consumers preferences and the

delivery system adapted to them make it impossible to return to previous solutions (Lu et al., 2020). Therefore, one should focus on the optimization of the current system by looking for new and more effective solutions, including the delivery pricing model.

### 3. Methods

The commencement of the conceptualization of the process of the dynamic delivery pricing model was preceded by a SWOT analysis, which was to define the delivery as a competitive factor in the foodservice services sector. The obtained results constitute the background for the further part of the study.

The objective scope of the study was the foodservice sector, while the subjective scope was the evaluation of delivery costs. The research method used was a case study. However, to optimize the structure of the proposed model, a triangulation was used, taking into account quantitative and qualitative data. The quantitative data was both secondary (the situation of the foodservice sector) and primary (delivery costs for individual premises). Qualitative data was obtained by conducting in-depth interviews with delivery couriers in the city of Sosnowiec. Individual In-depth Interviews (IDIs) were carried out on from April 28 until May 3, 2022, and 4 drivers from 3 restaurants took part in them. The aim of the individual in-depth interviews was to identify weaknesses of the currently used delivery models and factors influencing the pricing of delivery. The questions in the IDIs concerned the current delivery model and valuation costs, as well as perceived problems with the current model. In addition, drivers were asked to evaluate the delivery system functioning up to that point, both in terms of the effectiveness of deliveries (route optimization) as well as costs.

In the study, the cost of delivery  $c$  will be treated as an endogenous variable, while  $\alpha$  will be the constant term defining the basic cost of delivery for all deliveries.

The general specification of the delivery cost pricing model can be written as follows:

$$c = \alpha + X \quad (1)$$

where  $X$  – vector of variables affecting the delivery cost.

The course of the research process was as follows:

1. Noticing the problem of the stability of delivery costs.
2. Defining delivery as a competitive factor – SWOT analysis.
3. Verification of the effectiveness of the use of fixed delivery costs – conducting IDIs.
4. Identification of the causes of ineffectiveness.
5. Determining the determinants of delivery cost.
6. A proposal for a dynamic delivery pricing model.

## 4. Methods

### 4.1. Delivery as a competitive factor

Businesses in the foodservice sector should assess their strengths and weaknesses and concentrate on the characteristics of the environment in order to adjust to the competitive environment. It is possible to use a SWOT analysis for this purpose. The basic form of this analysis is utilized in this study to highlight potential challenges and possible threats in the area of delivery in the foodservice sector. The analysis is presented in Table 1.

**Table 1.**

*SWOT analysis for the surveyed enterprises from the foodservice industry*

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• long period of cooperation with couriers (trust)</li> <li>• knowledge of the city's topography by drivers</li> <li>• long range of deliveries</li> <li>• diversification of means of transportation (cars and bicycles)</li> </ul>	<ul style="list-style-type: none"> <li>• organizational problems</li> <li>• ignorance of current trends</li> <li>• ineffective delivery pricing</li> <li>• long delivery time</li> <li>• employee dissatisfaction</li> <li>• expensive to maintain vehicles (outdated models)</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>• development of modern technologies and information systems</li> <li>• ability to reach new customers</li> </ul>	<ul style="list-style-type: none"> <li>• price volatility (including fuel, take-out packaging, electricity)</li> <li>• changing regulations and laws (suppliers on scooters)</li> <li>• increased competition in the market</li> </ul>

Source: own study.

The couriers are part of the strengths in the area of delivery. Long-term cooperation can result in increased trust. Such a courier can carry out the courses faster, because during the course he focuses fully on the work and knows the topography of the city well. The long range of deliveries makes it possible to reach customers within the city and even neighboring cities. Delivery times can be improved by using a variety of delivery vehicles, e.g. cars and bikes. Couriers on bikes, who won't be slowed down by traffic, can perform better in densely populated areas. Customers who value environmentally friendly solutions can also positively view this delivery technique.

Issues with management are among the weaknesses, such as difficulties operating various platforms in the field of foodservice at the same time, and the lack of optimization of the drivers' routes. City-wide deliveries and deliveries to neighboring cities can cause long delivery times and thus customer dissatisfaction. Delivering minimum-value orders to remote parts of cities may be considered counterproductive. It may turn out that there are solutions on the market that can improve the procurement and delivery process. However, managers or owners are not familiar with contemporary trends. Vehicles used by restaurants may be ineffective and expensive to maintain. If the supplier has his own vehicle, the employer covers the necessary expenses, and with certain car models, these can be very high. As a result of the aforementioned problems, general dissatisfaction for employees may arise.

Among the distinguished opportunities in the area of deliveries, the development of modern technologies was noted, which means the possibility of using new, dedicated applications for foodservices. Cooperation with food delivery platforms such as Pyszne.pl can help attract new customers. New solutions and the possibility of using ICT systems can improve the delivery process and determine the optimal delivery cost. Enterprises can use couriers working for established brands such as Uber Eats, Glovo.

As threats indicated were the volatility of prices related to the execution of the delivery, where particular attention should be paid to the increase in the prices of fuel and electricity as well as disposable packaging. The volatility of regulations and laws relates both to the growing costs of maintaining a business and the modernization of regulations in the context of modern technologies that can be used by an enterprise. Although modern technologies may allow to gain new customers, only with proper use of their potential, a significant increase in competitiveness could be achieved.

In summary, considering each column of the SWOT matrix (Table 1) proves the importance of delivery as a factor that influences competitiveness. It is necessary to include ICT in business, since it can be a source of increasing efficiency, e.g. order fulfillment for regular customers, and on the other hand, it allows to attract new customers. Furthermore, proven suppliers who know the topography of the city are able to deliver the order using cars and bicycles. Thanks to this, it is possible to build a positive image of the company, and, thus, attract new customers. A fast and efficient method of delivery could build a competitive position on the market, especially when new companies appear. Contracting bicycle couriers may prove efficient given the rising costs of fuel. Then management issues, such as excessive number of deliveries or mistaken orders, may create a negative public perception. Moreover, inappropriate use of ICT can limit the exploitation of the opportunities that technology brings. The highlighted delivery weaknesses may increase the risk associated with the threats. Vehicles that are expensive to maintain can increase the financial burden on enterprises. Setting a fixed price with high volatility of its determining factors may generate costs greater than the revenues from the delivery.

#### **4.2. Identification of variables determining delivery costs – IDI results**

The defined research area determined the course of the research process, as well as the approach to each of its stages. The identified problem, expressed as the ineffectiveness of the current delivery cost system, was subjected to a deeper analysis with the use of IDIs. In table 2 the respondents' statements were presented along with the identified weakness in the current approach to the calculation of delivery costs.

**Table 2.***Identification of weaknesses in the current delivery cost model*

Driver	Statement	Identified weakness
M (64 y/o)	"The price of delivery is independent of the time I spend on commuting - during rush hours it is the same as off-peak hours, and I waste more time"	Price based only on distance, not traffic
M (19 y/o)	"In our company, it is annoying that the deliveries are made in sequence, sometimes I could take something next door, but another driver gets it" "I could do two close runs instead of one far run. Besides, for two close ones I would earn more, because what is counted is the individual run" "Sometimes there is such a traffic that we lack drivers and other times two go to the same place at the same time"	No route optimization  Opportunity cost for short versus long deliveries
M (37 y/o)	"I don't like going to the city center, because it happens that I get stuck in a traffic jam and the next deliveries are already waiting for me" "It happened that someone ordered over the phone and did not pick up the order later"	Traffic  No order verification
F (34 y/o)	"The waiting time for the customer, sometimes 15 minutes after the order has been placed, is a problem. In that time I could make a different delivery"	Time spent on delivery

Source: own study.

The main problems were identified as a derivative of not taking into account the volume of traffic when carrying out a delivery. Furthermore, it should be noted that with the help of the traffic flow, the opportunity cost can be determined similarly to the route efficiency for a given provider. The next step was to determine the variables that are currently included in the valuation of delivery costs (Table 3).

**Table 3***Identification of the variables affecting the cost of delivery*

Driver	Statement	Delivery cost factor identified
M (64 y/o)	"I do not know how the prices are set, but for the same amount I go to the end of Dąbrowa Górnicza and further parts of Sosnowiec, it takes much more time"	Fixed cost ( $\alpha$ )
M (19 y/o)	"We have 3 price zones for deliveries which depend only on the distance" "The price does not depend on the form of payment, it is faster when someone prepayes the order, because then I only hand it over and go on"	Distance  Payment method
M (37 y/o)	"We don't include packaging costs in the delivery cost, as others do. We include it in the price of the items from the card" "The only thing is whether someone has to place a minimum-amount order or we will increase the cost of delivery"	Additional aspects related to delivery  The entrepreneur's profit from the delivery
F (34 y/o)	"Sometimes it happens that I go once to the same place and it takes 10 minutes, and once for 20 - but the cost for the buyer is the same"	Fixed cost ( $\alpha$ )

Source: own study.



### 4.3. A proposal for a shipping cost pricing model

A delivery cost based only on distance can be written as follows:

$$c_s = \begin{cases} c_{s_1} & \text{when } 0 < s < s_1 \\ c_{s_2} & \text{when } s_1 < s < s_2 \\ \dots & \dots \\ c_{s_n} & \text{when } s > s_n \end{cases} \quad (2)$$

The answers of the respondents confirm that the presented approach is ineffective. In addition, IDIs allowed for the identification of factors determining the cost of delivery and classification into two groups:

- fixed (e.g. driver's remuneration for each trip, defined delivery zone),
- variable (e.g. traffic volume, number of packages).

Therefore, the proposal for the deconstruction of the model (1) will contain aspects independent of the order expressed as  $\alpha$  and factors of the variables X. It should be noted that some of the X variables can be expressed as a combination of other factors, e.g. using the formula for delivery time:

$$t = \frac{s}{v} \quad (3)$$

where:

$t$  – delivery time,

$s$  – route,

$v$  – average delivery speed.

It is worth emphasizing that  $s$  is constant, so  $t$  depends on the average speed of delivery, which is mainly influenced by the traffic volume ( $tv$ ). In addition, the smoothness of driving translates into fuel consumption ( $m$ ), which can also be estimated using the traffic volume. The distance and traffic intensity also affect the possibility of alternative deliveries, e.g. three shorter ones instead of a longer one. The opportunity cost of delivery will be denoted by the variable  $a$ . Using the dynamic approach makes it necessary to express  $c_s$  as a function:

$$c = \alpha + f(m|tv, t_s|tv, a|t_s) \quad (4)$$

In addition to the fixed cost ( $\alpha$ ) for delivery, independent of the delivery characteristics, e.g. packaging prices, the model takes into account the traffic volume, which allows for the estimation of delivery costs, fuel consumption depending on the traffic situation, time for delivery, and therefore also the opportunity cost for other supplies. Therefore, the concept of a dynamic delivery cost pricing model makes it necessary to determine the volume of traffic as it affects many aspects related to it. Utilizing contemporary technologies, such as cell phone signal analysis, might be useful when estimating the volume of traffic.

## 5. Conclusions

Delivery is a key aspect of the business activity in the foodservice sector and can be seen as a factor of the company's competitiveness, which was confirmed by the SWOT analysis performed. Delivery may be an opportunity to attract new customers, as well as to fulfill orders from regular customers. However, numerous errors in their implementation, such as delivering later than expected or mistaking orders pose a threat to the business. Fixed delivery costs can reduce revenues and generate losses in the event of a high fluctuation in fuel prices. Therefore, it is crucial to properly evaluate delivery costs, taking into account not only the distance, but also other variables. This is particularly important as the COVID-19 pandemic has changed consumer behavior, increasing e.g. the number of deliveries.

The current delivery cost models are based on the average cost of delivery, which, as the suppliers themselves note, does not lead to optimization. This is due to the basic observation that delivery conditions are never constant but rather highly volatile. For example, it may turn out that for close deliveries the cost would be lower than assumed, and for long-distance deliveries in the event of transport congestion, it would be very high. These problems can be solved using a dynamic model of delivery costs pricing.

Although determining the cost of a specific delivery is a complex process, as indicated by the persons directly involved in deliveries, the key factors of delivery costs include: one-time cost for the courier's course, distance, opportunity cost of a given delivery expressed as the possibility of making another delivery, defined as delivery time. It should be emphasized that it ought to be determined by the volume of traffic at a given moment. Considering the traffic volume is necessary in order to optimize the delivery price, and its determination can be done using ICT, although simple solutions, such as Google Maps, are also available. It should be noted that the impact of the individual components of the cost of delivery should be presented transparently to the customer.

Despite the diversification of data sources, the used methods, and due diligence, it was not possible to eliminate the shortcomings of the study. The primary limitation of the study, as in the case of all conceptual research, is proposing a theoretical model that has not been empirically verified. Therefore, it is, in a way, an initial framework for further research and development, especially when optimizing the structure and parameters of the model. A considerable issue is, although in line with the assumptions of the methodology, the small number of cases which the considerations are based on. Including more cases may reveal other problems and additional ways of considering other factors affecting the height of the shipping cost.

Nevertheless, though the study was theoretical, it was based on a real problem, providing many practical applications. The proposed model provides solutions for the foodservice industry, allowing for the optimization of delivery costs. The considered model in the study is

not a particular novelty, as the dynamic price models currently in use are implemented in the valuation of transportation services, including UBER and BOLT. The implementation of a dynamic model in a new market sector can be described as an innovation, which could help not only entrepreneurs, but also customers. An extension of the considerations presented in this study would be the application of the proposed approach in practice. Therefore, future research may focus on the implementation of the model and its empirical verification.

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