Sustainable Management and Business in the Area of Grocery Shopping - The Efficiency of Grocery Shopping (EOGS) Project

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Net sales in the German food retail sector exceeded EUR 250 billion in 2022. This market is therefore not only interesting due to its sheer size, but also due to recent developments in online retail. In addition to the dominance of traditional store sales, online delivery services and providers that deliver groceries to your doorstep in just a few minutes are alternatives for customers. Various perspectives need to be examined to assess the sustainability of business and trade in this sector. On the one hand, it is about providers with a focus on delivery services, who are competing for customers' favour with various concepts and delivery modalities. On the other hand, the focus is on consumers, who now have a range of alternatives for purchasing food. Additionally, one can investigate how sustainable a delivery service purchase is compared to a stationary purchase. Methodologically, the project is carried out with practical case studies with a recording and analysis tool (EoGS-tool). The first stage of the project will focus on testing the practicability and usability of the tool and evaluating the initial results. In a second stage, the recording and evaluation of purchases is to be expanded through cooperation with other universities.

Keywords:
case studies, economic efficiency, grocery shopping, online food delivery services, sustainable business models

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1 Introduction

According to statista, net sales in the German food retail sector amounted to more than 252 billion Euros in 2022 (statista, 2024a). This market is therefore not only interesting due to its sheer size, but also due to recent developments in online retail. In addition to the dominance of traditional store sales, online delivery services and providers that deliver groceries to your doorstep in just a few minutes via inner-city delivery hubs are alternatives for customers.

Two perspectives need to be examined to assess the sustainability of business and trade in this sector. On the one hand, it is about providers with a focus on delivery services, who are competing for customers' favor with various concepts and delivery modalities. On the other hand, the focus is on consumers, who now have a range of alternatives for purchasing food.

The EoGS-project focuses on three central questions:

Q1. Where do end consumers buy economically? In stationary retail or online retail?
Q2. Do online delivery services work profitably compared to bricks-and-mortar retail?
Q3. How "ecologically sustainable" is online shopping compared to bricks-and-mortar retail?

Methodologically, the project is carried out with practical case studies for which an Excel-based recording and analysis tool is used (EoGS-tool). The first stage of the project in winter semester 2024/25 will focus on testing the practicability and usability of the EoGS-tool and evaluating the initial results. In a second stage, the recording and evaluation of purchases is to be expanded through cooperation with other universities in Germany and abroad.

2 Theoretical Background / Literature review

Food retail is the sector with the highest turnover in the entire German retail sector (statista, 2024b). The product range of food retail companies consists primarily of food, but often also includes near-food products such as cleaning products. Over-the-counter retail is characterized by various forms of operation such as

supermarkets, discounters, hypermarkets and self-service department stores. Before the internet age, this classic form of distribution was the only one that existed, so this phase could be described as "Grocery 1.0".

New forms of distribution emerged with the internet, although these only had a niche existence under the heading of "food eCommerce". One example is the company myTime (myTime, 2024), which has been offering groceries on a website and sending them by parcel since 2012. Another example is REWE, which with a market share of over 20% is one of the top five German food retailers. They operate a delivery service with small trucks since 2012. This phase could be described as "Grocery 2.0", as the internet is used as a sales channel here with a delivery time of a few days (Singh & Singh, 2023).

The coronavirus pandemic was an accelerator for further dynamic development of the online market (Wiedemann et al., 2023). In addition to a growth spurt in sales in the online sector, new forms of distribution, which can be subsumed under the keyword "quick commerce", attracted attention. Customers are supplied from so-called city hubs or micro-depots, which are located in city centers and promise a delivery time of ten to twenty minutes. Examples of these companies are Gorillas, Flink and Picnic. This development phase could be described as "Grocery 3.0", in which traditional forms of distribution compete with established online delivery services and quick commerce service providers.

Table 1: Key characteristics of selected grocery online delivery services

Company	Product range	Forms of distribution/ Grocery x.0	Delivery type	Means of transport used	Delivery time promise
REWE	Full range retailer	Stationary and online/ Grocery 1.0/2.0	Regional hubs	Special conversion truck (ICE)	Next days with time slots
myTime	Full range retailer	Online/ Grocery 2.0	Parcel delivery	CEP vehicles	Next days
Flink	Limited product range	Online/ Grocery 3.0	Micro depot	Bicycle	Same day, > 10 minutes
Flaschenpost	Limited product range	Online/ Grocery 3.0	Micro depot	Van (ICE)	Same day, 120 minutes

Source: author's compilation

As the focus of the analysis is on online food delivery services, the following table provides an excerpt of the current grocery market with relevant providers and their key characteristics. The corresponding weblinks are listed under references.

The differences between the various providers are very clear. The main distinguishing features are the selection of products (Product range), the means of transport used (Means of transport used) and the promised delivery times (Delivery time promise).

3 Methodology

As part of the EoGS-project, working groups are formed with several students who, in a first step, select two companies, one of which is an established stationary provider (Grocery 1.0) and the other an online provider (Grocery 2.0/3.0). In a second step, the working groups carry out various purchases in both companies. The relevant data is recorded using the Excel-based EoGS-tool. Various areas (accessible via Excel sheet registers) are available for data collection and analysis, which are briefly outlined below.

Shopping

All purchases are documented at item level in this sheet register. In addition to the product name, price and quantities, additional characteristics are recorded. These include, for example, information on packaging and a classification of logistical requirements. A scale from "very high" (e.g., for eggs) to "very low" (e.g., for tinned food) is available for the latter characteristic.

Price-Comparison

For selected products, one can compare the purchase prices from the various sources of supply in this register. It must be ensured that the products are the same and of the same quality. Differing packaging sizes are compensated by standardization. This allows to test the obvious hypothesis that products from online sources tend to have higher prices than stationary products. In addition, care must be taken to only compare so-called retail benchmark prices and not offer prices.

Opportunity

The name of this sheet register already underlines the focus of the content: opportunity costs. This central term in economics describes the lost profit or benefit of an alternative. Opportunity costs typically arise when capital is used for investments, in which the lost interest on a safe investment reduces the return on the investment as imputed interest. In the case of grocery shopping, opportunity costs arise for stationary shopping from the time spent on various stationary shopping activities, such as driving to the store or waiting in a checkout queue. For online shopping costs arise from dealing with apps or web sites and the delivery time of groceries ordered online. These costs are interesting from the perspective that online food orders are advertised as "time-saving" (ntv, 2012). Based on Coase's transaction cost theory, these additional costs to the purchase costs can also be described as typical "transaction costs", which consist of initiation and processing costs (Coase, 1937; Williamson, 1975; Picot & Dietl, 1990). The time required for shopping is based on a process-related sequence that comprises various process stages and is supplemented by "real" costs in the form of transportation costs depending on the means of transport used for shopping in a stationary store. In addition, the environmentally relevant CO_2 emissions are determined from the customer's perspective (Klein & Popp, 2023).

Table 2: Process structure of the purchasing processes from customer's perspective

Process step description	Examples of retail outlet	Examples of online delivery
01-Prepare shopping	Look for bags, pack up empties	Start up PC, open app
02-Reaching the shopping destination	Find vehicle, drive to store, park, walk to store	Open the website, log in
03-Vehicle costs outward and return journey	E.g. car (ICE, BEV), bicycle, public transport	/
04-Shopping	Take goods from the shelves	Search and add to shopping cart
05-Checkout	Checkout line, pay	Pay for order
06-Drive to home	Pick-up vehicle, pack, drive to home, park, walk to home	/
07-Online delivery time	/	Delivery time
08-Unpacking/clearing out	Unpacking things, putting things away, disposing of garbage	Unpacking things, putting things away, disposing of garbage

Source: author's compilation

By adding up the individual time expenditures, you can compare which form of purchasing is actually more time-saving. The average purchasing times per purchase and per purchasing item are calculated as key figures. Opportunity costs are calculated by multiplying the total time spent by an hourly rate in Euros per hour. From a student perspective, this could be an hourly rate that represents typical pay for student jobs such as the current minimum wage in Germany of 12.82 Euros/hour. In view of the fact that you cannot work without interruption and that buying food is one of the necessities of life, one can also set lower values. It is more difficult to set a cost rate for the delivery time of food ordered online. Argumentatively, this cost rate could be based on the costs incurred due to the delivery time-related loss of the ordered food or the risk of late or non-delivery. In addition to the opportunity costs, thus time costs, the costs for vehicle use incurred for the outward and return journey to the stationary shopping location are also recorded. Average values for consumption and costs as well as values (coefficients) for tank-to-wheel (TtW) and well-to-wheel (WtW) CO_2 emissions are provided for the means of transportation used.

Delivery variable Costs

While the opportunity section addresses the perspective of a customer, the next two sections deal with the perspective of an online delivery service; starting with variable costs. When delivering food, the respective company has to manage various process steps itself, which are usually taken over by the customer in the case of a stationary purchase. In addition to costs, energy consumption and CO_2 emissions are allocated using average values for the vehicles used. The following table shows the process steps for which costs can be allocated in each case.

Table 3: Process structure of online delivery service

Process step description	Costs description
01-Picking	Cost of order picking
02-Transport packaging	Cost of packaging the ordered goods depending on the logistical requirements, e.g. pressure or temperature sensitivity
03-Shipment	Depending on the business model, different modes of transportation can be recorded, e.g. vehicles or parcel shipping
04-POS packaging	In some business models, packaging is only carried out directly before delivery at the POS (point of sale)

Source: author's compilation

Delivery Fixed Costs

Fixed costs are also referred to as operating costs and are independent of quantity. In this respect, this section includes, for example, rents, leases, IT costs, insurance, etc., which are necessary to operate the business model for online delivery. Determining exact cost values is a particular challenge, especially when determining or estimating fixed costs such as rent or insurance. In this respect, the basic principle of making conservative estimates applies. For this reason, in addition to the possibility of applying various reference values for the allocation of fixed costs to a delivery (e.g., number of parcels delivered, number of food items delivered or the number of orders (commissions)), one has the option of setting the fixed cost component to zero to exclude this aspect from evaluation and analysis.

Profit

This section deals with the profitability comparison of the various business models. In a first step, the return for stationary as well as online purchases is calculated on the basis of average values for trading margin and costs from an empiric study (Dellbrügge, 2022). In a second step, a profit calculation is created for online delivery. This takes into account additional sales that are usually charged in online trading, such as delivery charges or fresh produce surcharges. For the purchase cost of goods sold, one can either use the same values for stationary retail or use modified values if you assume that the purchasing conditions are either better or worse than in stationary retail. Credit notes are also included, taking into account sales, cost of goods sold, variable delivery costs and any fixed cost components. Credit notes play virtually no role in stationary retail, as shoppers generally select the goods themselves, particularly in the case of fruit and vegetables. For online delivery services, the risks of damage or deterioration in quality during transportation are much higher. This applies in particular to foods that have high logistical requirements because of pressure or temperature sensitivity. As it usually makes no sense to return damaged goods, a credit note is usually issued. Profits are calculated at different levels. The calculation of Profit I is shown here as an example:

Table 4: Profit I calculation schema

Calculation scheme	Explanation	Example
Net turnover	Cash value without VAT	50.00 Euro
x Delivery Margin in %	Based on empiric study	30.00 %
= Delivery Margin absolute		15.00 Euro
+ additional revenue	E.g. delivery charges or freshness surcharges	5.00 Euro
= Delivery shopping margin (calculated)		20.00 Euro
./. Delivery costs I	Calculated in section Delivery variable costs; only direct energy costs of vehicles	27.32 Euro
= Profit I		-7.32 Euro

Source: author's compilation

4 Results

In order not to go beyond the scope of this paper, the following is limited to selected results from cases of the course Logistic Management, 5th semester of Bachelor Logistikcs, in winter term 2024/25. The results shown provide answers to the questions formulated at the beginning. The following results relate to practical case studies with the companies EDEKA, REWE, myTime and Flink.

Table 5: Excerpts from the results (∑ = sum; Ø = average; n.c. = not calculated)

Company	Grocery x.0	No. of purchases/ total no. of purchased items	Cash sum incl. VAT/ net sum excl. VAT in €	Opportunity duration per purchase/ per item in min	Profit* (in Euro) /return on net sales (%)	TtW per purchase/ per item in kg CO_2
EDEKA	1.0	4/62	147.52/132.83	50.50/3.3	€4.7/3.6%	2.01/0.13
REWE	1.0	2/15	25.66/23.36	32.4/4.3	€0.6/2.4%	0.15/0.02
		∑ 6/77	∑ 173.18/156.19	∑Ø **41.45**/3.8	∑Ø **2.7** (3.0%)	∑n.c.
REWE	2.0	1/19	58.41/52.07	33.0/1.7	**€-7.4** (-14.2%)	9.65/0.51
myTime	2.0	2/15	34.81/31.77	15.1/2.0	**€9.0** (28.4%)	0.55/0.07
		∑ 3/34	∑ 93.22/83.84	∑Ø **24.05**/1.85	∑n.c.	∑n.c.
Flink	3.0	2/15	30.25/27.58	Ø **4.20**/0.60	**€7.4** (26.7%)	0/0

Source: author's compilation * Profit (for retail outlet) and Profit I (for online 2.0/3.0)

5 Discussion

With regard to the first question (Q1), economic efficiency from the customer's perspective, we will only briefly discuss shopping time (opportunity time) here without consideration of the delivery time. If you compare the time it takes to shop, online shopping actually saves a considerable amount of time. The average shopping time per purchase in bricks-and-mortar stores is 41.45 minutes compared to just 24.05 minutes for online retailers type Grocery 2.0. Ordering via the (Flink) app seems to be even more effective, as it only takes a very short 4.2 minutes per purchase. If you look at the profit situation (Q2), you can see that in principle, profits can be made in stationary retail, albeit at a low level; in this case 2.7 Euros, which corresponds to an industry-standard return on sales of 3.0%. In the case of REWE online delivery, the use of a delivery vehicle combined with a long delivery time resulted in high delivery costs, which ultimately led to a loss (€-7.4). The parcel shipper MyTime benefits from high extra fees that are charged for shipping. The calculated profit is €9.0. The profit of €7.4 with Flink comes from the low delivery costs due to the short delivery distance, which is covered by bicycle. However, it should be noted once again that certain types of costs are not included in profit I, in particular fixed cost components, credit notes and full cost components for the use of vehicles. Against this background, it can be assumed that the calculated profit margins can vary considerably in practice. When it comes to sustainability (Q3), the route and the vehicle used play the biggest role. If you go to the supermarket on foot or by bike, the CO_2 emissions are of course significantly lower than if you use a car. The same applies to online delivery services. Flink scores very well here, as bicycles are used. For myTime, an average value of CO_2 emissions per parcel was used for parcel delivery mode.

6 Conclusions

At this point, it must be emphasized that no general conclusions can be drawn due to the limitations of the collected data. Firstly, only a few purchases were made and secondly, the items purchased represent only a fraction of the total range of goods in the food retail sector. Thirdly, the analysis is limited to the last mile of distribution and does not take the entire supply chain into account. Nevertheless, insights can be gained from the results. Given the background objective of engaging students with interesting tasks that include both theoretical and practical aspects, the EoGS-

project can be considered a success. The participating students learned how to deal with scientific methodology, basic rules in the construction of databases and their evaluation. The EoGS-tool used was revised and improved several times. In addition, numerous discussions made it possible to deal with business management issues against the background of practical experience, e.g., the consideration of opportunity and transaction costs in purchasing decisions or when choosing between a brick-and-mortar store or online alternatives. In the second step already mentioned in the introduction, even more case studies now need to be carried out in order to increase the significance of the results. Collaboration with other universities in Germany and abroad is planned.

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