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THE IMPACT OF WEBSITE PERFORMANCE ON BUSINESS SALES

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Abstract

In this study, we aimed to investigate the financial implications of website performance on restaurant visitor traffic. It is crucial to address the current challenges faced by the restaurant industry, such as decreasing diner numbers due to rising prices, which can have a negative impact on the financial results of companies. Recognizing the significance of maximizing profitability, especially for small businesses operating in a highly competitive industry, we sought to explore the potential of website performance as a driver of increased visitor traffic and daily menu sales. We conducted a two-month field experiment in which we measured morning website visits and daily lunch menu sales for a restaurant with a slower website and one with a quicker website. However, we did not find any statistically significant increase in visits to the restaurant as a result of improving the website's speed. We conclude that there may be other ways to improve daily menu sales beyond website speed. The restaurant industry is highly competitive, and small businesses in particular need to carefully consider how to allocate their resources in order to maximize profitability. The results of our study suggest that investing in website redesign as a means of increasing visitor traffic may not be the most effective tactic for small restaurants. Our research highlights the importance of conducting experiments and gathering data to inform decision making, as it can help small businesses in the restaurant industry to make more informed choices about how to allocate their resources. By understanding the factors that do and do not impact sales, small restaurants can make more informed decisions and achieve their business goals.

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Introduction

The issue of page load speed holds significant financial implications for businesses and web designers alike. Ensuring a fast website is crucial for any business owner, as it is widely known that users have little patience for slow-loading sites. This article will explore the financial aspects of page load speed by highlighting research that illustrates its impact on conversions. Notably, a majority of these studies focus on the e-commerce sector, further underscoring the financial significance of optimizing website performance. However, the question is: What impact can site speed have in a traditional business like the restaurant industry? Today, it is standard for almost every business to have a website or, at the very least, a presence on social media networks. Similarly, restaurants post their current lunch menus on the aforementioned channels. In the following study, we focused on websites. The investigation aims to analyze the financial implications of website performance on restaurant visitor traffic. It is crucial to investigate the current challenges faced by the restaurant industry, such as decreasing diner numbers due to rising prices, which can have a negative impact on the financial results of companies. Recognizing the significance of maximizing profitability, especially for small businesses operating in a highly competitive industry, we aimed to explore the potential of website performance as a driver of increased visitor traffic and daily menu sales. This study will focus on a single restaurant and utilize internal financial and business data to explore the relationship between website performance and lunch menu sales. By examining how improvements in web loading speed can potentially influence customer behavior and purchasing decisions, valuable insights can be gained regarding the financial implications for the restaurant industry in the Czech Republic.

As part of the study, a two-month experiment will be conducted to measure morning visits to the restaurant website and daily lunch menu sales. Measurements will be taken during normal operation and again after a month, after the site has been sped up. The measurements will use Google Analytics to further explain visitor behavior on the website. Google Analytics is a service that provides insight into site visitors and provides tools to understand the user journey. The data collected will be compared to actual sales. The study will look at whether speeding up the website has an impact on the number of lunches sold in the restaurant.

Our motivation in this research is to find out whether restaurants' investments in speeding up and redesigning their websites will pay off, and whether their sales will increase. After all, the restaurant industry is highly competitive, and small businesses in particular must carefully consider how to allocate their resources to maximize profitability. If there is a correlation between site speed and the number of lunches sold, this would be a simple change that businesses could apply to generate more profit.

The rest of this paper is organized as follows: a review of the literature and theoretical background is available in the chapters Role of a Website in Restaurant Business and Website Speed. The methods used for the research are described in the Methods chapter. The results of the research are presented in the Results chapter. The Conclusions chapter summarizes the findings of the study and includes a discussion of its limitations.

Literature review

The restaurant industry is one of the most traditional and oldest industries. It has become an integral part of supporting the tourism industry, as travelers increasingly head to certain destinations specifically for food (Daries-Ramon et al., 2019; Miranda et al., 2015).

Internet innovations have influenced the development of the restaurant industry. Restaurants have become increasingly aware of the power of the web and are an ideal example of a web services market that benefits from the internet. Indeed, the Internet has become the fastest growing advertising mechanism in the restaurant industry and provides significant market potential (Kim et al., 2012). Simultaneously, it serves as an effective method for distributing goods and information services (Daries-Ramon et al., 2019). Indeed, information search plays an important role in the consumer's choice of restaurant, and in the decision of which restaurant to choose for their visit (Yilmaz & Gültekin, 2016).

Corporate websites are an important space for corporate self-presentation (Hacioglu, 2019). These websites normally include information about the products the company offers, contact information and job vacancies (Torrington et al., 2017). In the case of restaurants, offering menus or current lunch menus is also an essential part of the website (Brewer & Sebby, 2021).

Restaurant websites are considered one of the most important information sources (Yilmaz & Gültekin, 2016). The advantage of websites is that they are universally accessible and necessary information can be placed on them (Kim et al., 2012). The fundamental point of the prosperity of a website is its level of usability (Taimouri et al., 2019).

Visitors can form a positive or negative opinion about the restaurant by visiting the website. They can also induce the consumer to physically visit the restau-

rant. It is also for this reason that many restaurants have created websites to inform and attract consumers (Yilmaz & Gültekin, 2016). However, if a restaurant's website lacks the information consumers are seeking or is difficult to navigate, it's likely that consumers will overlook it. In such cases, they may turn to alternative sources or competitors for the information they need, potentially resulting in lost business opportunities for the restaurant (Rosalin et al., 2016). Therefore, investing in an effective website that meets consumer expectations and provides relevant information can yield financial benefits for restaurants by attracting and retaining customers.

The speed of data processing and loading has always been an important issue in the context of the Internet. Continuous advances in information and communication technologies (ICT) date back to the early 1980s. This has led to well-known transformations in how we acquire information and especially in terms of speed (Aldammagh et al., 2021).

Page load speed reflects the performance of a website and has a significant impact on user experience. At the same time, site speed is also one of the factors investigated by the authors in the context of web quality assessment (Boshoff, 2007; Buenadicha et al., 2001).

This topic is becoming increasingly important because with the increasing amount of online resources, web visitors are becoming less tolerant of slow loading times. This may result in the visitor preferring to choose a different, faster website, as they will not have patience (Nielsen, 2000; Kim & Lim, 2001; Yen et al., 2007). Slow websites arouse frustration in visitors, which can negatively affect conversions on more than just the corporate website (Bartuskova & Krejcar, 2015). The primary causes of slow websites are often pages that contain large images, utilize responsive design, and excessively employ JavaScript scripting language (Bartuskova & Krejcar, 2015).

The time it takes for a page to load can be crucial for user loyalty. If people access government websites, they will stay on them, as they have no competition. However, for nongovernment sites, visitors leave if they take longer than 3 seconds to load (Lanza et al., 2022).

Amazon has found that every 100 ms of latency is costing them up to 1% of sales. Google has found that 0.5 seconds extra in the time it takes to generate search results will reduce traffic by up to 20% (Gigaspaces, 2019). Furthermore, recognizing the impact of loading times on user loyalty is essential for businesses operating in competitive sectors, where user retention directly affects financial outcomes.

Latency (page load speed) depends on the speed of the Internet, the access device and software, and the computational needs of the website (Basalla et al., 2021). This implies that even if a web page is optimized to load quickly by the operator, it may still load slowly for the user. For example, because the user does not have a fast enough connection.

Basalla et al. (2021) argue that even small changes in latency can have a significant impact on website usage. This will also be the subject of the planned experiment, as only a small change will be made, and we will observe how it affects sales.

How familiar a visitor is with a website may also have an impact on the results of studies looking at website speed (Basalla et al., 2021). If a first-time visitor accesses a website, their reaction may be different from that of a visitor who accesses the website regularly and is already familiar with it.

The increased use of mobile devices is a significant technological development. Surprisingly, the differences between mobile and nonmobile users in terms of latency sensitivity have not yet been scientifically analysed. Especially since mobile users are known to behave differently and websites are commonly designed specifically for mobile devices (Basalla et al., 2021).

Another factor that can enter into the rating is whether the user is in a hurry. If a user is in a hurry, there will be a greater chance that they will leave the site when it is slow to load than if they have the time and space to browse the site (Basalla et al., 2021).

Waiting online is also associated with lack of trust and a negative attitude towards the brand. However, waiting does not always involve negative emotional reactions, especially when waiting is followed by successful completion of the task at hand. The reaction to delay may be resignation and acceptance of a certain delay (Ryan et al., 2015).

Data methods

The restaurant industry is highly competitive, and small businesses in particular need to carefully consider how to allocate their resources in order to maximize profitability. The restaurant industry in the Czech Republic is facing significant changes in consumer behavior due to rising food prices. Recent data from food voucher card payments reveals that Czechs are actively cutting down on lunch expenses in response to the rapid increase in food prices. The average spending on lunch during this period was CZK 160.20, marking a 10.1% increase compared to the previous year. However, this rise in spending does not match the pace of food price inflation, which has surged by 23.5% year-on-year.

Moreover, data from the Czech Statistical Office (CSO) and the Ticket Restaurant Card Index, indicates a growing trend of people opting for cheaper meals

and visiting more affordable restaurants. The proportion of restaurant diners has declined to the current level of 53%. This trend of cost-cutting in lunch expenditures is likely reinforced by the overall rising inflation and increasing cost of living. Despite the intentions of 60% of companies to raise wages, a survey by Edenred suggests that these wage increases are unlikely to fully offset the impact of inflation.

The data from Table 1 provides insights into the changing lunch prices in the Moravian-Silesian region and Czechia over a specific period. These data points highlight the substantial upward trend in lunch prices, signaling the challenges faced by consumers in managing their food expenses. The significant price increases imply a potential influence on consumer behavior, as individuals may start seeking cost-saving measures or making adjustments in their lunch choices.

Table 1: Development of the average spending per lunch in restaurants (CZK)

	Dec. 2015	June 2020	June 2021	Jan. 2022	May 2022	June 2022	Price increase 2020/2022	Price increase 2021/2022
Moravian-Silesian region	94.6	125.6	134.9	146.2	153.1	157.4	25.3%	16.7%
Czechia	101.7	135.3	145.5	153.4	159.3	160.2	18.4%	10.1%

Source: Author's own work.

The data suggests that restaurants experienced varying performance over the six-year period from 2015 to 2020 (Figure 1). The company demonstrated growth in turnover, with figures increasing from 332 in 2015 to 593 in 2019, indicating a positive trend in revenue generation. However, the net income exhibited fluctuations, with losses recorded in 2015 and 2020, and minimal profitability in the remaining years. Therefore, the insights provided are based on the available data up until 2020. On the other hand, it is clear from the current data on food service sales that they fall short of the results from the pre-Covid period. In combination with the finding that the financial results of restaurants, including the restaurant under study, have been deteriorating in recent years, it is necessary to adequately adjust marketing tools such as web communication.

Figure 1: Development of financial results of the monitored restaurant in thous. CZK
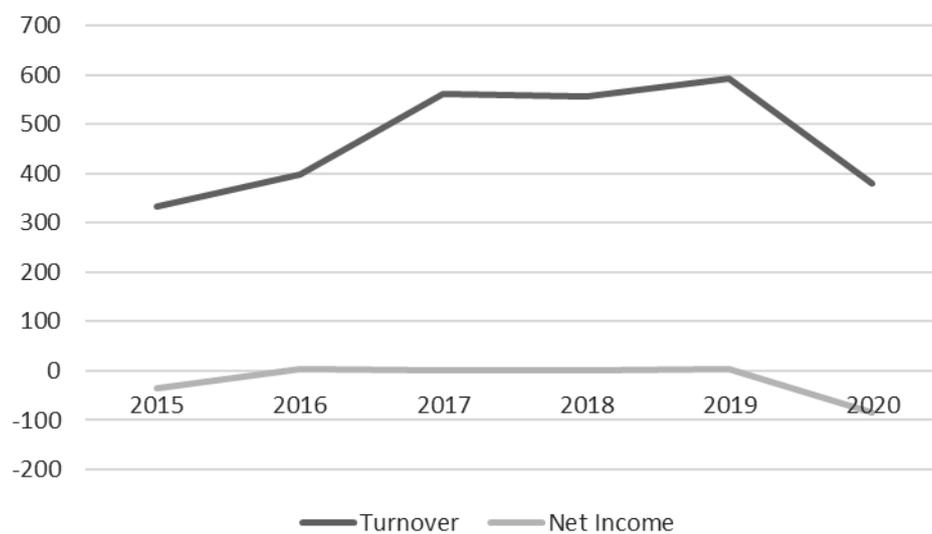
Source: Source: Internal data from restaurant.

In this study, we used real-world data observation instead of theory to form our hypothesis. For applied scientific disciplines (i.e. sciences that express statements about certain parts of reality, such as consumers) empirical observations are a key determinant in the scientific pursuit of truth (Schurz, 2013, p. 23). The theory first or observation first approach to research stimulates essential methodological debate. As Babin et al. (2016) discuss, the lack of robust marketing theories is a consequence of the tendency of academics in this field to primarily use hypo-deductive research. Researchers often believe that reviewers will be more comfortable with a strong theory, and therefore base

their hypotheses on theories from related fields rather than attempting to create theories directly from their discipline. They sacrifice discovery for justification, although the scientific method clearly requires attention to both.

Figure 2 presents the frequency of restaurant daily website visits by hour for three months (June – August 2022). It demonstrates sharp increase from 6:00 with most visits occurring at 11:00, followed by a small drop and relatively stable traffic from 14:00 to 20:00. Based on this data, we conclude that visitors are likely accessing the website to view the daily lunch menu, which is served from 11:00 to 14:00 or until it is sold out.

Figure 2: Total website visits during the day by hours
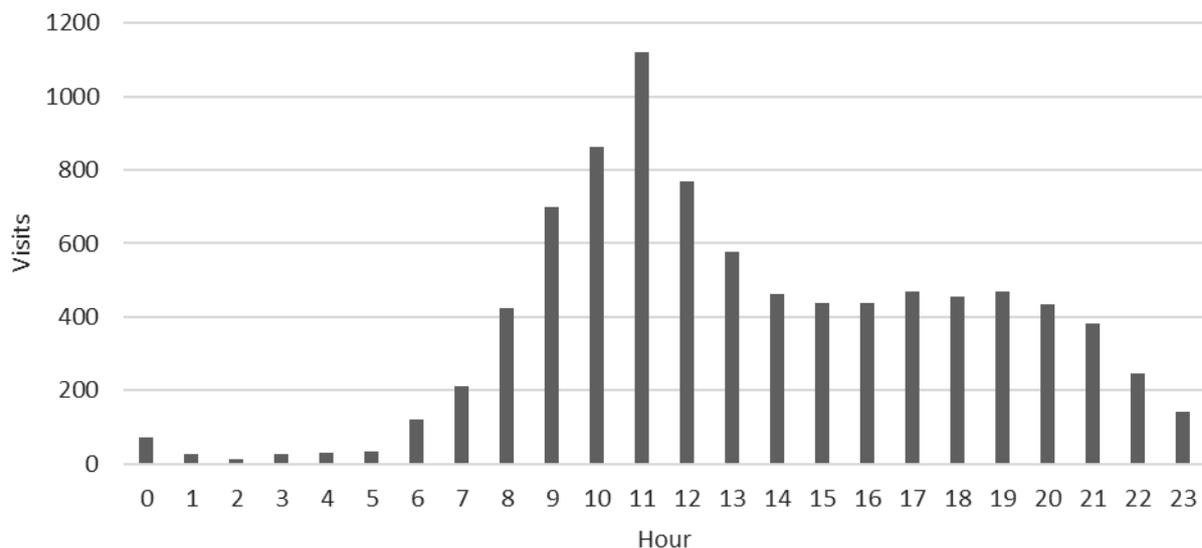
Source: Author's own work.

From this spike in web traffic, we can logically deduce that the number of morning website visits influence also physical visits in the restaurant which will consequently influence the number of daily lunches sold. Therefore, we form the following hypothesis and test our idea empirically:

H_1: Number of morning visitors on the website influences daily lunch menu sales.

The number of visitors was collected via the website analytics tool Google Analytics (GA) and daily lunch menu sales were provided by the restaurant manager using an export from accounting software. We assume the website visits to be the independent variable and number of sales is dependent since these events are separated by time. Due to the temporal proximity in which website visits precede visits to the restaurant and only a small portion theoretically overlap, we do not expect the opposite direction of influence.

Furthermore, the restaurant's website had poor loading speed, with the loading time of all elements

higher than the current standard (Lanza et al., 2022). On some devices it was more than 5 seconds to load the page. Therefore, the number of website visitors may be affected due to the inability to load all components and provide complete information about the daily menu. We observed that this measurement issue with Google Analytics often occurs when the script is placed in the <head> section or early in the <body> section of the website's HTML code. In our specific example, the GA script was located in the <head> section of the page. We therefore set up the field experiment and made the website load faster. We did that by optimizing the size of the images on the server that are displayed on the site and accelerated the loading of all elements of the site from seconds to milliseconds (depending on the device and operational system). We were then able to see the difference between a slow and fast website. Website speed is our independent variable and daily menu lunches sold the dependent variable. Based on these assumptions we form the second hypothesis.

H$_2$: When the page load time is reduced, the number of daily menu lunches sold increases.

Field experiment is a data collection strategy that employs manipulation and random assignment to investigate preferences and behaviors in naturally occurring contexts (Baldassarri & Abascal, 2017). To be specific, we used natural field experiment which is the same as a framed field experiment but where the environment is one where the subjects naturally undertake the tasks and where the subjects do not know that they are in an experiment (Harrison & List, 2004). The advantage of real behavior data over survey data is that it overcomes errors associated with customer memory and event recall (Lee et al., 2000; Nenycz-Thiel et al., 2013). Employing realistic experimental designs and measuring actual behavior are important and beneficial for consumer research (Morales et al., 2017). We have used pre-experimental design also known as the 'before and after' or 'pre- and post-test' design (Marsden & Torgerson, 2012). In this case it was impossible to run the control group since the website users cannot be tracked and paired with the consequential restaurant visit.

Our data covers the period from September 1st, 2022 to November 4th, 2022. The experiment with the website update was conducted in two phases: the page was slow from September 1st to September 30th, and then updated for improved loading speed from October 5th to November 4th. On some Mondays during both periods, the restaurant was closed for maintenance and cost-saving purposes due to high energy prices. However, both periods had the same number of days covered.

Before we move on to results, we provide more details about the experimental setting to allow comparison with future replications. The daily lunch menu consists of a soup and allows the selection of one main dish from three options. The restaurant's floor management team uploads the menu for the following week to a subpage called "Daily Menu" on the restaurant's website every Sunday. The weekly menu is also posted on the restaurant's social media accounts (Facebook and Instagram) on the first day of the week when the menu is served. No additional advertising is used to promote the menu nor additional content reposting. The restaurant is in the residential area on the outskirts of a 53 000 inhabitants city. No competition is in the radius of 2 kilometers. The main mode of transportation for accessing the daily menu at the restaurant is by car. The restaurant is visited primarily by people from the city center during lunchtime, but a small proportion is also local people who visit on foot. However, it is generally inconvenient for customers to leave the restaurant once they have entered, as the alternative dining options may be located too far away. This creates phys-ical constraints on the customers' dining choices. The city center visitors likely include working inhabitants, possibly seeking convenience and efficiency during their limited lunch breaks, making them more sensitive to website loading times. In contrast, local visitors might be less affected by this factor due to their proximity and potentially different lunchtime constraints. This loyal customer base suggests that the local visitors in both experimental periods were probably very similar in demographics and dining habits, providing a consistent baseline for comparison. On the other hand, the day-to-day behavior of our primary clientele is checking the daily menu every morning, it means that the website's loading time is a critical factor. These clients have integrated the checking of the business's daily menu into their daily schedule, and any delay could disproportionately affect their decision to visit the restaurant. The analysis of relationships was solved by the Tukey test.

The Tukey test, also known as the Tukey's Honestly Significant Difference (HSD) test, is a statistical analysis method used to identify significant differences between multiple groups or treatments in an experiment. In this methodology, the Tukey test was conducted using MS Excel.

Using the formula, we compute the HSD statistic for the Tukey test.

$$T = q * \sqrt{\frac{MSE}{n}} \qquad (1)$$

The mean squared error (MSE) can be obtained from the Anova output, specifically the MS error term. In this context, "n" represents the number of items in a single sample.

Research results

Since outliers can significantly impact the results of statistical analyses by skewing the data, we ran a Tukey test in MS Excel on both daily page visits and daily lunch menu sales to identify any outliers. We inserted the data and calculated the first and third quartiles, as well as the interquartile range and upper and lower bounds. We then created a function to highlight any outliers that were identified beyond these bounds. After performing these steps, we found that there were no outliers present in either the daily page visits or the daily lunch menu sales data for the whole period as well as for the two divided experimental periods. Thus, we can proceed with further analysis without outlier reduction. We then calculated data normality using MS MS Excel. The skewness of the data was 0.08 for menus and 0.15 for page visits, indicating a slight right skew. While the skewness is not particularly pronounced, this suggests that the distribution of the data is relatively

symmetrical but may contain a slightly higher number of values on the right side of the distribution compared to the left. In the case of a kurtosis value of -0.45 for menus and -0.37 for page visits, the data are flatter than a normal distribution. This means that the distri-bution has fewer and less extreme outliers compared to a normal distribution. It is generally accepted that skewness values of less than |0.5| are considered small (Field, 2013).

Figure 3: Total and average page visits in morning by hour
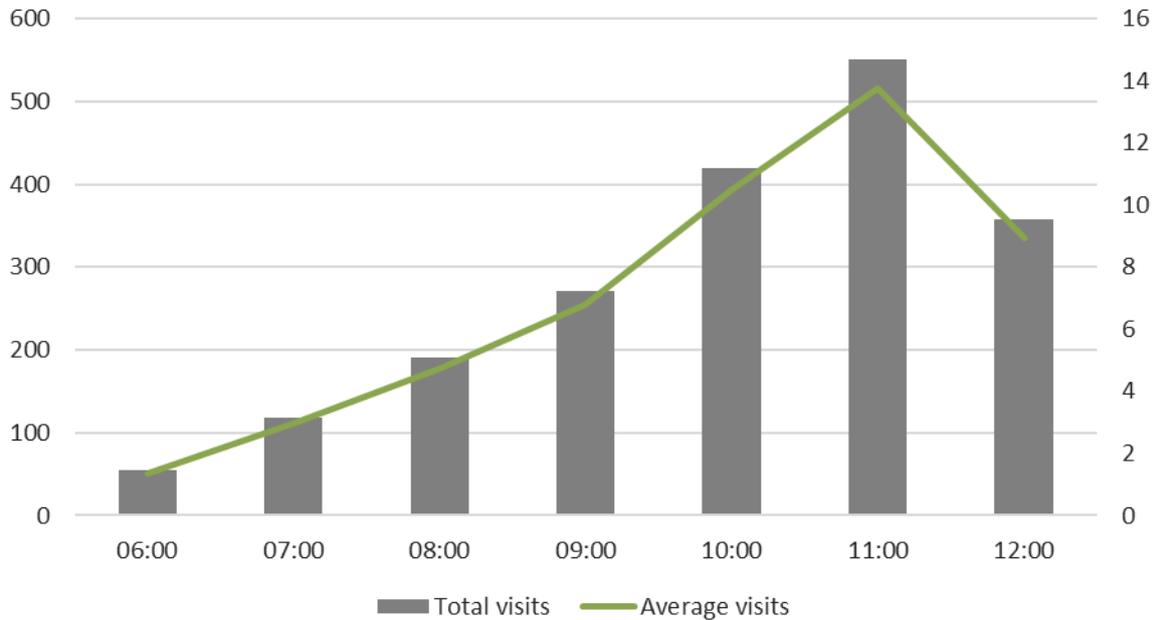
Source: Author's own work.

During the time period under investigation, we observed a spike in page visit data, similar to one which motivated our hypotheses (Figure 2). As shown in Figure 3, the most popular hour for page visits was 11:00 by both total and average page visits. We thus confirm the tendency to visit the restaurant page mostly in the morning hours. Figure 4 shows total and morning page visits in observed period. Both variables correlate at significance level 0.01.

Figure 4: Total and morning page visits in period
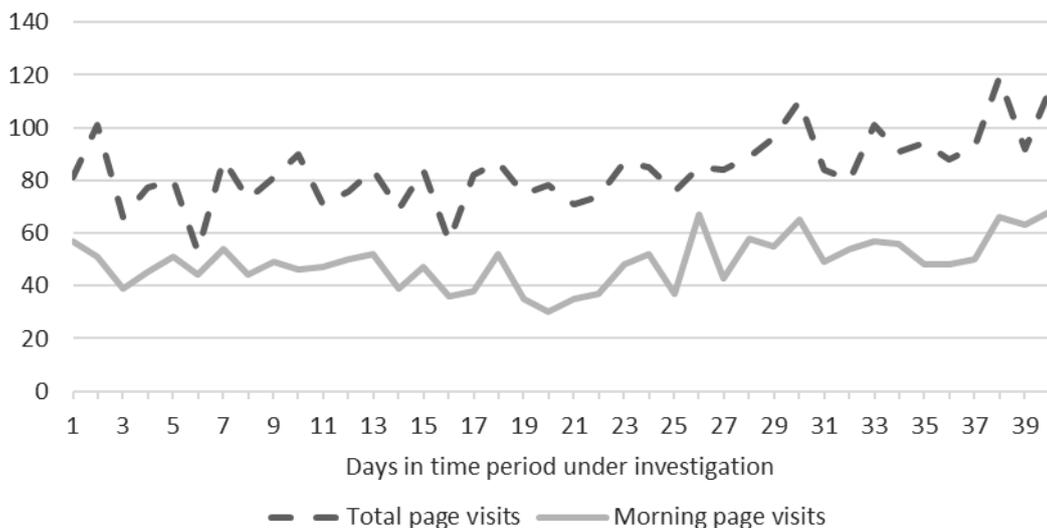
Source: Author's own work.

From Figure 5 it possible to see with the naked eye that these variables are not related. Nevertheless, we perform a quick statistical evaluation of the hypothesis. For our first hypothesis: Number of morning visitors on the website influences daily lunch menu sales. The process is as follows. We set the null hypothesis, that there is no correlation (H_0: r = 0) and alternative hypothesis that there is correlation (H_1: r > 0). The correlation coefficient of r = 0.06 suggests slight correlation between the two variables. By calculating t-statistics (0.38) we can match the p-value (0.70) with significance level α and accept the null hypothesis. In conclusion, there is not sufficient evidence to confirm a relationship between daily lunch menu sales and morning website visits.

Figure 5: Daily lunch menu sales and page visits in morning hours
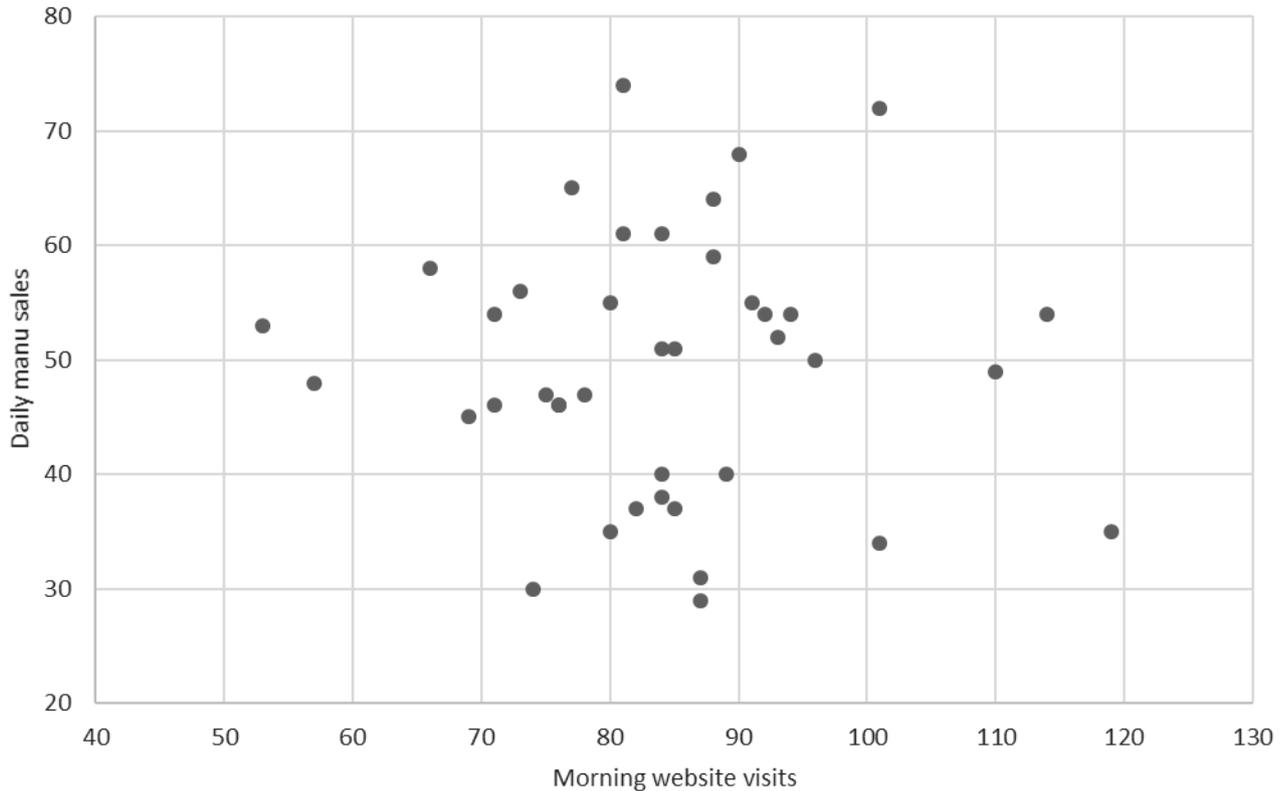
Source: Author's own work.

We can now proceed to our second hypothesis, which suggests that a decrease in page load time leads to an increase in the number of daily lunch menus sold. To determine whether this difference is causal, we conducted a t-test to compare the means of the before and after periods. The null hypothesis for this test was that there was no difference in means (H_0: m_1 = m_2), while the alternative hypothesis was that there was a difference (H_1: m_1 ≠ m_2). The P-value (0.04) for the test was lower than alpha (0.05), indicating that there is a statistically significant difference between the two data sets. Therefore, we reject the null hypothesis and conclude that there is a statistically significant differ-

ence between the means of the before and after periods. Interestingly, the measured difference is in opposite directions. The higher the speed for the website, the lower the number of daily lunch menu sales.

Figure 6 visually presents the results. During the pre-intervention period, there were fewer morning visits to the website, a trend not attributable to changes in website loading speed but likely influenced by other factors. Additionally, prior to the intervention, lunch menu sales were higher compared to after we reduced the website loading time. These findings suggest a complex interplay of variables impacting website traffic and lunch menu sales.

Figure 6: Before and after period daily results
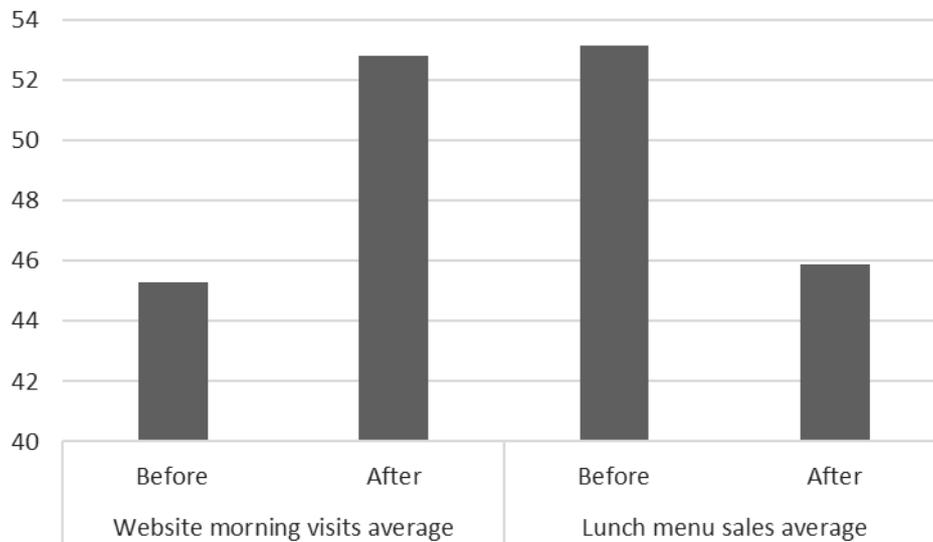
Source: Author's own work.

Conclusion

The data highlights the financial challenges faced by the restaurant industry, as consumers are actively seeking ways to save on lunch expenses in response to the steep rise in food prices. Restaurants need to adapt to this changing consumer behavior by offering more affordable meal options and ensuring competitiveness in the market. In this study, the aim was to investigate the financial implications of website performance on restaurant visitor traffic. Based on our findings, it appears that restaurant website traffic is not significantly related to daily lunch menu sales. This suggests that factors other than website traffic may be more important in driving restaurants visits. Additionally, we found that lunch menu sales during the first period of our observations (the before period) were not significantly different from those in the second period (the after period) during which we took steps to speed up the website. Overall, these results suggest that website performance may not be a major factor in driving lunch menu sales, at least in the context of this study.

In today's digital age, people rely more and more on online information when making dining choices, and it is therefore crucial for restaurants to consider their website design and speed in order to effectively reach and attract potential customers. On the other hand, it is important for small businesses, to carefully consider their limited resources when making financial decisions in this regard. While some business consultants may recommend investing in website design and speed to increase sales, it is important to recognize that what works for e-commerce businesses may not necessarily apply to the restaurant industry. While investing too much in website design and speed may not yield significant increases in sales, a poorly designed or slow web-

site can also have negative effects on the long-term brand image and reputation of the business. Therefore, it is important for restaurants to find a balance in their investment in website design and speed.

The literature search found that many authors claimed that site speed matters and can even affect loyalty, user experience and other feelings that are connected to the subsequent sales (Nielsen, 2000; Kim & Lim, 2001; Yen et al., 2007). But the vast majority of these articles described the e-commerce environment. There is almost no detailed information available on the impact of web speed on consumer behaviour in the real physical world.

Every study has its own set of limitations and constraints, and this study is no different. One of the main limitations of this study is the limited time frame of the data collection, which was only two months long, with one month serving as the before period and the other serving as the after period. Habits play a role in the selection of a restaurant for lunch and those are formed over an extended period of time. Some effect of page speed improvement thus can be spotted beyond the observed period. However, there is also an immediate effect expected. As a result of habits, people have a repertoire of brands in almost all categories from which they buy. So being one of the restaurants in a customer's repertoire is a sign of loyalty and people habitually select the restaurant from time to time. But having a habit does not mean visiting the restaurant without knowing what is on the daily menu (see: Figure 2). Being in a repertoire means the restaurant is in the room when the decision is made. But in this repertoire, there will still be a decision and evaluation of the alternatives each day. If the restaurant has a slow website, this could lead many customers not to wait and check

other restaurants where they can find the daily menu quickly. If they are satisfied with the first offer, they select it and do not come back to the slower page.

Moreover, there has been no control group due to difficult access to sensitive commercial sales data. This problem could be solved by analyzing data from another local restaurant to control for any extraneous variables. The economic situation in central Europe at the time of the study was also a potential limitation, as fluctuations in gas and electricity prices may have affected consumers' willingness to visit restaurants. However, data from daily website visits showed higher interest in restaurant website content (Figure 2). Further, our assumption that users in the control month were not seeing the daily menu quickly enough to stay on the page until it loaded all the content cannot be fully supported by evidence. The final limitation of this study is that we may not have been able to sufficiently speed up the website. Even after the website update, some users may still perceive the speed as being slow and leave the website before seeing the content, which could potentially impact our findings. These limitations may impact the generalizability of our findings and should be taken into consideration when interpreting the results of the study.

Further research is needed to fully understand the factors that influence lunch menu sales and to identify potential strategies for increasing restaurant sales. Planned research will explore the more detailed relationship between web loading speed and restaurant daily menu sales. Results from other restaurant businesses will be included so that differences can be observed. Also, the research will be longitudinal to see how results change over a longer time scale. We will also include in future research the impact of social media and observation of web traffic when promoting special offers.

Acknowledgements

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