

# Mladá veda

## Young Science





# Mladá veda

## Young Science

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# THE INFLUENCE OF THE LAST PUBLISHED RATING ON THE SALES SUCCESS OF AN ITEM IN ONLINE RETAILING

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## Abstract

The aim of the article is to determine what influence the last published review has on the sales success of an item, regardless of whether the average rating of the item has changed as a result of the last published review. For this purpose, the daily sales figures of over two thousand articles were examined over a period of 21 months depending on their last published rating of one to five stars from Amazon Germany. It was found that the last published rating has no measurable influence on the sales success of an item. Only half of the sample showed that sales of an item were higher if the last rating was positive rather than negative. Furthermore, no correlation was found between the number of stars and sales, even when only expensive or high-demand items were considered. This means that online stores or manufacturers do not necessarily have to react to the last review of an item in order to exploit sales potential.

Keywords: online trade, reviews, sales, Amazon, retail, rating

JEL classification: D19, D79, D90

## Introduction

The fact that customers can write reviews online is in fact as old as the internet itself. However, the number of customer reviews and their relevance to the sales success of a product has steadily increased with the rise of online retail (Shao, et al., 2014). Online reviews are preferably written texts in which products, services or institutions are rated by users and their experiences are described. However, reviews can also be written as videos and described with images. Buyers of products and users of services share their experiences so that others can read or view them in order to make a purchase decision about the product or service described. Customer reviews enjoy a very high level of credibility with their audience, more than advertising is able to do (Lee, et al., 2011). Reviews can be submitted directly in the respective online stores and in specially created portals where reviews of products, services and institutions are collected. The

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quality and number of customer reviews influence the sales of an item in online retail (Lin, et al., 2011). Nowadays, product reviews are even actively commissioned by manufacturers to ensure that product launches are as successful as possible (Wie, et al., 2013). One of the industry's current activities is the use of influencers and opinion leaders who have enormous social reach and who provide positive reviews to their audience before and during product launches in return for payment.

Jeff Bezos (2018), the founder of Amazon, referred to the beginnings of product reviews in an interview at the Forum on Leadership. He said that reviews should help the customer to make a purchase decision. Negative reviews are just as important to customers as positive reviews, even if publishing only positive reviews would generate more sales for the online store in question in the short term (Zhang, et al., 2014). Amazon was one of the first online stores in the world to make customer reviews the central feature of an item in order to increase customer confidence in a product and expand sales.

Over the last few years of growing online trade, reviews at item level have increased significantly and a single review hardly changes the average rating of an item. This paper therefore focuses only on the question of what influence the last rating given has on the sales success of an item, regardless of whether the average star rating of an item changes.

At EUR 84.6 billion, online retail already accounted for 14.7% of German retail sales in 2022 (Online Monitor 2023). Amazon Germany alone accounts for 56% of all online trade and is therefore a heavyweight in the German retail sector, which makes this marketplace and online store the core of this research. Amazon Germany alone accounts for 56% of all online retail, making it a heavyweight in the German retail sector. This means that more than half of online sales in Germany are generated on Amazon. Amazon is both an online store and a marketplace. As an online store, Amazon buys goods from manufacturers and sells them on to consumers in its own name and on its own account. On the marketplace, Amazon gives smaller independent retailers the opportunity to offer and sell their goods and charges a commission or marketplace fee. According to Online Monitor (2023), Amazon makes 30% of its sales directly and 70% via the marketplace. Amazon is structured in such a way that each item has its own unique product detail page and sellers and Amazon want to put themselves in the front position with the best offer. The best offer for an item, which is offered by several sellers and Amazon itself, ends up in the Buybox. The Buybox is a synonym for the best offer for an item, and the customer can also buy the item on Amazon. Each item receives its ratings regardless of which seller is selling the item. Amazon Germany is an online store set up at item level, in which retailers are listed and subordinated on the product detail page of an item. Each item is only available once on Amazon.

### **Theoretical Background**

It is already known that the number and quality of online reviews have a significant influence on the sales figures of an item in online retail (Sudirjo, et al., 2023). And the quality of customer reviews also increases the willingness of others to shop online (Quan, et al., 2023). The credibility of the rating, the scope of the written text and the comprehension of the language as well as the relevance also have an influence on the sale of a product (Fernandes, et al., 2022). With the advancement of time and the dominance of Amazon in online retail, star ratings of

one to five stars have become established in addition to product ratings via written text. In addition to the written text, each product review was also given a rating. The author of the review also had to give an overall rating of the product using a rating scale. This is provided by awarding one to five stars. One star means that you are not satisfied overall with the product and the purchase and five stars mean that you are very satisfied. The star ratings in between are gradations between extremely satisfied and very dissatisfied. However, zero stars cannot be awarded, which definitely influences the average star rating. As an aside, it should be mentioned that since 2020, Amazon has also made it easier for its customers to rate a purchased product by simply clicking on the specified star scale without writing a review in text form. This was not possible before. Star ratings were only possible if a rating or review was also written about the product. The average star rating is usually displayed prominently on the product pages of online stores so that the next customer can see at a glance whether other buyers are predominantly satisfied with the product or not. Customer reviews also show the level of trust in an online store (Thakur, 2018). The more customers trust a certain online store, the more willing they are to write a product review. In addition, the number of reviews shows other customers that the online store in question can be trusted. It can be said that Amazon enjoys a very high level of trust among consumers in Germany.

On Amazon, the average star rating is always displayed directly below the item name and to the right of the product images. If you search for a product on Amazon, the average star rating, including the number of ratings given, is also displayed among the various search results, which reflects the importance of the rating of an item. This gives the next customer a quick overview of whether the item has already been sold many times and whether previous buyers were satisfied with their purchase. If you search for a requirement or a specific search criterion on Amazon, you will receive countless product suggestions. The so-called search page delivers the best and most suitable results for the customer's search term. Thanks to artificial intelligence and highly specialized algorithms, the search results are sorted for the customer so that the best option is at the top. The purchasing behavior of other shoppers who have searched for the same search term and, above all, the reviews of an item are taken into account when ranking the search results. Poorly rated items are not displayed as prominently as comparable items with a better average star rating. The number and level of star ratings therefore have a considerable influence on the findability of a product and therefore also on sales success. Star ratings make the market more transparent for customers and an important component of sales success for manufacturers. The better a product is rated, the better the sales opportunities.

On Amazon, the consumer has the option of sorting the reviews by relevance and by time or topicality in order to find the reviews of interest to them more quickly in the mass of reviews. Users want to be able to retrieve the information that is important to them with as little effort as possible. Otherwise, clutter can also interrupt a purchase process if there are many reviews (Lackermair et al., 2013). Relevance in this context means how often these reviews have been read by others and classified as helpful (Singh, et al., 2017). Order by time and recency means that the most recently published reviews are displayed to the user first.

An additional added value for the end customer is the internal Amazon ranking of an item. Amazon ranks its items in an internal sales ranking according to units sold in various product categories. The better an item sells, the better its sales ranking. And the better the sales

rank, the better certain items are displayed on Amazon for certain search queries. The higher up an item is displayed on Amazon, the better the chance that the item will be found and purchased by the customer. It is similar to Google, the higher up the search results, the better the clicks. The Amazon sales rank per product category is displayed on the Amazon product detail pages and is visible to every customer.

### **Research Question**

The aim of this paper is to find out whether the most recently published review has a measurable influence on the sales figures of a product, regardless of whether the average star rating of an item changes as a result of the most recent review. Does a product sell better on Amazon if the last review was positive? Does the same product sell significantly worse if the last rating was negative, even if the average rating does not change as a result of the last rating? Should manufacturers and online retailers therefore ensure that the most recent reviews are positive in order to ensure or increase sales success?

### **Hypotheses**

Many products on Amazon already have a very long-life cycle and have been sold on Amazon for several years. It is not uncommon for items to have several thousand reviews, meaning that a single review no longer has any influence on the average rating of an item. As users on Amazon only have the option of sorting reviews according to relevance and recency, the most recent review in particular should have an influence on a customer's decision to purchase an item. The hypothesis is that the last published review of an author in particular has a measurable influence on the sales figures of an item on Amazon Germany and therefore influences the potential buyer in their purchase decision. This means that if the last review only has one or two stars, the sales figures are worse on average than if the last review was rated with four or five stars. In addition, the effect is stronger for more expensive products and weaker for products that are sold a lot.

### **Method & Data**

For this research, the daily sales figures and the daily Amazon sales rank from 01.01.2022 to 30.09.2023 of 2,277 different items from different product categories of Amazon Germany are examined, depending on their last written review in text form including the star rating (Table 1). The data was collected by a scraping & analysis software called AMVIsor on Amazon Germany. The date of publication and the number of stars awarded are available for reviews written by customers. The rating can be easily accessed by the potential customer or reader by sorting. The average daily sales figures are recorded depending on their last rating. The hypothesis is confirmed if the average daily sales figures are higher if the last rating has four or five stars than if the last rating has only one or two stars.

Our selected sample contains 2,277 different articles from different product categories from a period of 21 months. The articles were selected from thousands of other articles if they were able to fulfil predefined conditions. The conditions for the sample were that each of these items must have been visible and sellable on Amazon every day in our chosen time period. To ensure that a single review does not have a significant influence on the overall rating of an item,

the items in the sample must already have at least 50 reviews. Of these, at least 10% must be negative (one- and two-star ratings) and at least 10% positive (four- and five-star ratings). A certain proportion of the sample of 1,012 articles was able to show all star ratings from one to five stars.

Day	01.01.2021			02.01.2021			...	30.09.2023		
	daily sales	sales rank	last review	daily sales	sales rank	last review		daily sales	sales rank	last review
Product 1	105	2323	5	56	56	2		134	564	5
Product 2	45	234	2	36	10765	2		76	8654	4
Product 3	342	7586	3	453	411	5		234	2694	1
...										
Product n	274	3412	4	265	2969	4		187	2509	1

Table 1 – Collecting Shema  
Author's own according to scraped data by AMVIsor

This study examines the entire sample of 2,277 items and the subset of 1,012 items that have all reviews at least once. To confirm the hypothesis, the negative and positive ratings must correlate positively with the units sold. The hypothesis is not confirmed if the ratings do not correlate with the units sold. The Pearson correlation coefficient is used for the tests. The closer the correlation coefficient is to one, the stronger the correlation between the value ranges. The closer the value is to zero, the weaker the correlation. If the correlation coefficient is less than zero, there is an inverse dependency.

To find out whether the last rating of an article has a measurable influence on the sales figures, the average daily sales figures are first determined for each possible last star rating. The average daily sales figures per item are therefore calculated (1), depending on their last rating for one-, two-, three-, four- and five-star reviews (Table 2). In addition, the one- and two-star reviews (2) and the four- and five-star reviews (3) are grouped together to determine their average daily sales figures.

$$aS_{1-star} = \sum_{n=1}^n \frac{(S_1+S_n)}{n_{1star}} \quad (1)$$

$$aS_{1\&2 star} = \sum_{n=1}^n \frac{(S_1+S_n)}{n_{1\&2star}} \quad (2)$$

$$aS_{4\&5 star} = \sum_{n=1}^n \frac{(S_1+S_n)}{n_{4\&5star}} \quad (3)$$

$aS_{(i-star) \dots}$	Average sales per day
star...	Last Review in stars (1-star, 2-star, 3-star, 4-star and 5-star)
$aSR_{(i-star) \dots}$	Average Amazon Sales Rank
S...	Sales in units per day
$n_{star \dots}$	Number of days with the respective last star rating
$r_n \dots$	correlation coefficient by Pearson
$\mu \dots$	Mean value of the correlation coefficient at item level
$\sigma \dots$	simple standard deviation
R...	Amazon Sales Rank
Dif(n)...	Difference



For the entire sample of 2,277 items, the star ratings were grouped into negative (one- & two-star) and positive (four- & five-star) ratings and the average daily sales were directly compared depending on the last rating (Table No. 2). If the difference between the average daily sales was positive, the hypothesis was confirmed; if the difference was negative, the hypothesis was not confirmed (4). If exactly 50% of the articles show a positive and 50% of the articles a negative difference, there is no correlation and no dependency. Of the entire sample, only 1,176 articles or 51.6% were able to achieve higher sales if the last evaluation was positive. 48.4% of the sample, or 1,101 articles, were unable to confirm the characteristic of higher daily sales in the case of a positive evaluation.

$$\text{Dif} = \text{aS}_{(4\&5 \text{ stars})} - \text{aS}_{(1\&2 \text{ stars})} \quad (4)$$

	Price	sold units total	aS (1-2 stars)	aS (4-5 stars)	Dif(n)
<b>product 1</b>	9,68	6.076	8,15	9,68	1,53
<b>product 2</b>	21,88	2.897	3,75	4,71	0,95
<b>product 3</b>	9,34	4.007	4,57	6,41	1,84
...	...	...	...	...	...
<b>product n</b>	11,27	260	0,22	0,42	0,20

Table 2 – Average sales per day and product depending on the grouped rating of the last review  
Author's own according to scraped data by AMVIsor

In the sub-sample of 1,012 articles, in which each article can have any form of rating from one to five stars, a correlation (5) between star rating and daily sales can be determined (Table 3).

$$r_n = \frac{\sum(\text{star} - \overline{\text{astar}})(S - \overline{\text{aS}})}{\sqrt{\sum(\text{star} - \overline{\text{astar}})^2 \sum(S - \overline{\text{aS}})^2}} \quad (5)$$

$$\sigma = \sqrt{\frac{1}{n} \sum_{i=1}^n (r_n - \bar{r})^2} \quad (6)$$

1.012 items	price	sold units total	aS (1-star)	aS (2-stars)	aS (3- stars)	aS (4- stars)	aS (5- stars)	r <sub>n</sub>
<b>product 1</b>	10,60	357.628	245,86	255,82	503,33	279,16	285,31	0,15
<b>product 2</b>	10,60	327.534	388,64	237,69	479,30	292,05	249,05	-0,35
<b>product 3</b>	27,30	319.350	486,37	348,24	415,10	416,41	467,45	0,09
...	...	...	...	...	...	...	...	...
<b>product n</b>	5,09	265.380	184,26	251,14	156,98	210,51	218,24	0,12

Table 3 – Average sales figures per day and product depending on the rating of the last review including the correlation coefficient per item, the item price and the units sold in the period under review  
Author's own according to scraped data by AMVIsor

In the subset of 1,012 articles, a mean value of all correlation coefficients per article of 0.02 was determined with a simple standard deviation (6) of +/- 0.45. A correlation of zero means that there is no correlation. A correlation coefficient of one indicates a strong correlation. The



subset of 1,012 items includes item prices from €0.23 to €1,147.90 and total sales volumes in the period under review of 90 to 357,628 units.

This means that a further subset can be used to check whether the average correlation between valuation and sales changes if only items with a purchase price greater than €100.00 are considered. The correlation coefficient of 137 items changes only slightly in this subset to 0.04 with a simple standard deviation of +/- 0.43.

In another subset, the correlation coefficient between valuation and sales was examined in relation to the sales figures. 184 items sold more than 20,000 units in the period under review. The average correlation coefficient between valuation and sales for products in higher demand is -0.03 and a simple standard deviation of +/- 0.43.

Finally, the correlation (7) between star rating and sales rank per item is examined and the mean value is determined. The simple standard deviation (8) is then used to show the spread. To determine the correlation between star rating and sales rank, 996 articles can be used, which had a reported rank for each day in the period under review (Table 4).

$$r_n = \frac{\sum(\text{star} - \overline{\text{astar}})(R - \overline{aR})}{\sqrt{\sum(\text{star} - \overline{\text{astar}})^2 \sum(R - \overline{aR})^2}} \quad (7)$$

$$\sigma_R = \sqrt{\frac{1}{n} \sum_{i=1}^n (r_n - \bar{r})^2} \quad (8)$$

With a mean correlation coefficient of only 0.08 and a standard deviation of 0.46, the previous results are confirmed. There is also no correlation or connection between the customer rating and the Amazon sales rank. This confirms the results of the previously analyzed samples and subsets.

996 items	aSR(1-Stars)	aSR(2-Stars)	aSR(3-Stars)	aSR(4-Stars)	aSR(5-Stars)	r(n)
<b>Product 1</b>	45	55	65	75	85	1,00
<b>Product 2</b>	40	45	34	55	23	-0,32
<b>Product 3</b>	230	567	250	300	756	0,54
...						
<b>Product n</b>	150	152	155	250	120	0,12

Table 4 – Average Amazon sales rang per day and product depending on the rating of the last review including the correlation coefficient per item

Author's own according to scraped data by AMVisor

## Results

The hypothesis that the last review of an article has a significant influence on the sales success of an article applies to 51.6% of the articles in the total sample of 2,277 articles. This means that 48.4% show a contrary result. This means that the hypothesis is not significant for the entire sample or for the subsets. If one assumes that the sales figures of an article can only be higher or lower, the natural distribution is equally distributed at 50% each. Even in the sub-sample of 1,012 articles, in which all articles had all star ratings, no correlation could be proven. There is also no correlation between the last rating and sales if the items were particularly expensive or in high demand. This means that neither the price of an item nor the demand for an item has

any influence on the correlation between the last review and units sold. Last but not least, no correlation and no connection between customer rating and Amazon sales rank could be proven, which confirms all previous test series.

It can be concluded that the results of this study do not support the hypothesis. The last review of an item has no measurable influence on the sales figures of an item, even though users can access and read the last review on Amazon relatively easily, unlike many other reviews.

### **Discussion**

The fact that the number and average of product reviews have a significant influence on the sales success of products in online retail has already been proven in other papers. Although the situation here is that, logically, well-selling products naturally have more customers and therefore more reviews. If products are sold well, they are certainly also rated well. However, product reviews certainly have a greater influence on sales success when products have just been launched and initial experiences are shared between buyers. In this paper, it should only be checked whether the most recent customer review has an influence on the sales figures of an item and whether this is influenced by the item price, or the total quantity sold.

### **Conclusion**

There are many influences on the sales success of an item in online retail. Customer reviews are certainly an important driver for customers, but by no means the only one. The trust of a brand, the quality of items, the price or even the presentation of products in online retail are certainly more important parameters for stable and increasing sales figures. There are already several studies that prove that customers are guided in their purchasing decisions by customer reviews. The aim of this paper was to examine whether the last published customer review has a measurable influence on the sales success of an item. However, only 51.6% of all articles in the sample showed that sales were higher with a positive rating than with a negative rating. 48.4% of all articles in the sample did not exhibit this characteristic. Even in the sub-sample in which the one-star and five-star ratings were directly compared, no correlation was found between the degree of rating and sales. The value and demand of a product cannot establish a correlation either. Manufacturers and online stores do not have to react specifically to the last customer review or force a positive customer review in order to secure sales.

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doc. Mgr. Ing. Petr Wawrosz, Ph.D.*

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