On Biases in Online Reviews and the Moderating Effect of Review System Design

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Table of Contents

Synopsis

Submitted Research Papers that Form Part of this Dissertation

1. Gutt, D., Neumann, J., Zimmermann, S., Kundisch, D., and Chen, J. 2019b. "Design of Review Systems – A Strategic Instrument to Shape Online Reviewing Behavior and Economic Outcomes," *The Journal of Strategic Information Systems* (28:2), pp. 104-117 (doi: 10.1016/j.jsis.2019.01.004).

2. Gutt, D., Neumann, J., Jabr, W., and Kundisch, D. 2020. "The Fate of the App – Economic Implications of Updating under Reputation Resetting," *Working Paper*, Paderborn University.

3. Neumann, J., Gutt, D., and Kundisch, D. 2021. "Reviewing from a Distance – Uncovering the Negativity Bias of Psychological Distance in Online Word-of-Mouth," *Working Paper*, Paderborn University.

4. Neumann, J. 2021. "When Biased Ratings Benefit the Consumer – An Economic Analysis of Online Ratings in Markets with Variety-Seeking Consumers," *Working Paper*, Paderborn University.

Co-Authored Publications on Online Reviews not Included in this Dissertation

1. Gutt, D., Neumann, J., Jabr, W., Kundisch, D. 2021. The Fate of the App: Economic Implications of Updating under Reputation Resetting, contribution at: *Sixth Workshop on Information System Design and Economic Behavior (ISDEB 2021)*. (newer version with different research focus)

2. Poniatowski, M., Neumann, J. 2020. Getting Personal with Review Systems – Analyzing the Influence of Personality Traits on the Relationship between Review Templates and Reviewing Behavior, in: *Proceedings of the 28th European Conference on Information Systems (ECIS)*, Research-in-Progress.

3. Seutter, J., Neumann, J. 2020. Reviewing the Simple Things – How Ease of Evaluation Affects Online Rating Behavior, in: *Proceedings of the 28th European Conference on Information Systems (ECIS)*.

4. Poniatowski, M., Neumann, J. 2020. You Write What You Are – Exploring the Relationship between Online Reviewers' Personality Traits and Their Reviewing Behavior, in: *Tagungsband der 15. Internationalen Tagung Wirtschaftsinformatik 2020 (WI)*, Short Paper, Potsdam, Germany.

5. Seutter, J., Neumann, J., Kundisch, D. 2020. Nudging in Judging – Differences in Online Rating Behavior for Utilitarian and Hedonic Service Aspects, in: *Tagungsband der 15. Internationalen Tagung Wirtschaftsinformatik 2020 (WI)*, Short Paper, Potsdam, Germany.

6. Seutter, J., Neumann, J. 2019. Head over Feels? Differences in Online Rating Behavior for Utilitarian and Hedonic Service Aspects, in: *Proceedings of the 40th International Conference on Information Systems (ICIS)*, Research-in-Progress, Munich, Germany.

7. Neumann, J., Gutt, D. 2019. Money Makes the Reviewer Go Round – Ambivalent Effects of Online Review Elicitation in B2B Markets, in: *Proceedings of the 25th Americas Conference on Information Systems (AMCIS)*, Cancun, Mexico.

8. Neumann, J., Gutt, D., Görzen, T., Kundisch, D. 2019. When does Local Status Matter? – The Relationship between Reviewer Location and Perceived Usefulness of Online Reviews, in: *Proceedings of the 25th Americas Conference on Information Systems (AMCIS)*, Cancun, Mexico.

9. Poniatowski, M., Neumann, J., Kundisch, D. 2019. Reviewing the Vendor or the Product – Analyzing Vendor versus Product Representation in B2B Review Systems, in: *Proceedings of the 25th Americas Conference on Information Systems (AMCIS)*, Research-in-Progress, Cancun, Mexico.

10. Poniatowski, M., Neumann, J., Görzen, T., Kundisch, D. 2019. Organizing Their Thoughts – How Online Review Templates Affect the Review Text, in: *Proceedings of the 27th European Conference on Information Systems (ECIS)*, Stockholm, Sweden.

11. Gutt, D., Neumann, J. 2019. The Virtues of Anonymity – An Empirical Investigation of the Relationship between B2B Online Ratings and Reviewer Self-Disclosure, in: *Proceedings of the 27th European Conference on Information Systems (ECIS)*, Research-in-Progress, Stockholm, Sweden.

12. Neumann, J., Gutt, D. 2019. He Who Pays the Piper Calls the Tune: Online Review Elicitation by Sellers and Third-Party Platforms in B2B Markets, in: *Proceedings of the 27th European Conference on Information Systems (ECIS)*, Research-in-Progress, Stockholm, Sweden.

13. Poniatowski, M., Neumann, J., Görzen, T., Kundisch, D. 2019. A Semi-Automated Approach for Generating Online Review Templates, in: *Tagungsband der 14. Internationalen Konferenz Wirtschaftsinformatik*, Research-in-Progress, Siegen, Germany.

14. Neumann, J., Gutt, D., Kundisch, D., van Straaten, D. 2018. When Local Praise Becomes Cheap Talk – Analyzing the Relationship between Reviewer Location and Usefulness of Online Reviews, in: *Tagungsband der Multikonferenz Wirtschaftsinformatik 2018 (MKWI)*, Research-in-Progress, Lüneburg, Germany.

15. Neumann, J., Gutt, D., Kundisch, D. 2017. A Homeowner's Guide to Airbnb: Theory and Empirical Evidence for Optimal Pricing Conditional on Online Ratings, contribution at: *INFORMS Conference on Information Systems and Technology (CIST)*, Houston, USA.

16. Neumann, J., Gutt, D. 2017. A Homeowner’s Guide to Airbnb: Theory and Empirical Evidence for Optimal Pricing Conditional on Online Ratings, in: *Proceedings of the 25th European Conference on Information Systems (ECIS)*, Guimarães, Portugal.

Co-Authored Publications not Concerning Online Reviews that are not Part of this Dissertation

1. Seutter, J., Müller, M., Neumann, J., Kundisch, D. 2021. Do Smart Product Service Systems Crowd Out Interactions in Online Communities? – Empirical Evidence from a Cooking Community, contribution at: *International Conference on Challenges in Managing Smart Products and Services (CHIMSPAS 2021)*.

2. Müller, M., Neumann, J., Gutt, D., Kundisch, D. 2020. Toss a Coin to your Host - How Guests End up Paying for the Cost of Regulatory Policies, in: *Proceedings of the 41th International Conference on Information Systems (ICIS)*.

3. Müller, M., Gutt, D., Neumann, J. 2018. Beschreib mir deine Wohnung und ich sag' dir wer du bist – Eine explorative Analyse von Gastgeberpersönlichkeiten auf Airbnb, in: *Tagungsband der Multikonferenz Wirtschaftsinformatik 2018 (MKWI)*, Student Track, Lüneburg, Germany.

4. Kundisch, D., Neumann, J., Schlangenotto D. 2017. Bitte stimmen Sie jetzt ab! – Ein Erfahrungsbericht über das Audience Response System PINGO, in: *Proceedings der 15. e-Learning Fachtagung Informatik (DelFI 2017)*, Chemnitz, Germany.

5. Bach, C., Kundisch, D., Neumann, J., Schlangenotto, D., Whittaker, M. 2016. „Dokumentenorientierte NoSQL-Datenbanken in skalierbaren Webanwendungen – Eine Analyse am Beispiel von MongoDB und der Webanwendung PINGO," *HMD Praxis der Wirtschaftsinformatik*, (53:4), pp. 486-498.

6. Kundisch, D., Herrmann, P., Whittaker, M., Neumann, J., Magenheim, J., Reinhardt, W., Beutner, M., Zoyke, A. 2013. Designing a Web-Based Classroom Response System, in: *Proceedings of the Design Science Research in Information Systems and Technologies 2013 (DESRIST)*, Lecture Notes in Computer Science (LNCS), Vol. 7939, Springer.

Synopsis

1. Motivation

"Consumers are empowered by Yelp and tools like it: before, when they had a bad experience, they didn't have much recourse. They could fume, but often nothing else other than tell their friends."

– *Jeremy Stoppelman, CEO of Yelp Inc.* [1]

In the early days of e-commerce and online markets, few consumers were brave enough to do online shopping, while the majority were concerned about not being able to physically inspect the products and feared being exposed to fraudulent sellers (Ipsos MORI 2000). The design of these markets did not allow consumers to tell apart high-quality products from low-quality ones, or honest sellers from opportunistic ones. The information asymmetry between consumers and sellers is not a new phenomenon, however, as it has been analyzed for offline markets since 1970. Akerlof has shown that such asymmetry is a central cause for market failure, with sellers of high-quality products being driven out of the market (Akerlof 1970). Ironically, the resounding success of online markets suggests that the threat posed by information asymmetry has been overcome. As predicted by Bakos in 1991, online markets have not only become a means of exchanging products and services but also offer a space where consumers can share their consumption experiences. Customers can review their experiences publicly and inform potential consumers about the quality and taste match of past consumption experiences (Sun 2012; Zimmermann et al. 2018). The accessibility of these reviews helps those consumers searching online with their purchase decisions. According to Bakos' (1991) prediction, online reviews thus reduce the information asymmetry between buyers and sellers, which ultimately prevents the market from failing (Akerlof 1970).

Since their first introduction on marketplaces like Amazon or eBay, the systems that present customers' reviews (i.e., review systems) have become a staple of today's online landscape. They have been implemented by a multitude of online shops but also by third-party platforms. Moreover, their use is not limited to products and services sold online but also permeates to the offline world with local stationary businesses being reviewed on Yelp or Google Maps Reviews. Typically, past customers publish a review consisting of a textual description and a numerical rating (e.g., 3 out of 5 stars). Review systems do not only collect and present these reviews publicly, but also provide additional metrics such as an average of all numerical ratings. Previous studies (e.g., Chevalier and Mayzlin 2006; Wu et al. 2015) as well as market surveys present empirical evidence suggesting that the information presented by these systems substantially influence consumer decision making. For instance, in 2019, 56% of German online shoppers reported that they read online reviews to inform their purchase decision (Bitkom 2020). In line with this, the literature has demonstrated that increases in a product's[2] average

[1] This quote was published in an interview by Dredge (2013).

[2] In the following, 'product' refers to physical products but also to services.

rating (also referred to as *valence*) and in the number of reviews (also referred to as *volume*) causally lead to more sales (Chevalier and Mayzlin 2006; Luca 2016) as well as to an increase in pricing power (Feng et al. 2019).

The impact of online reviews on consumer decision making, at first sight, lends support to the notion that review systems successfully reduce the information asymmetry between buyers and sellers. However, these systems still exhibit *informational inefficiencies* that impair the reduction of information asymmetry. For example, there are differences in the average ratings of the same apartments between Airbnb and TripAdvisor (Zervas et al. 2020). In an ideal setting where review systems allow consumers to see the population mean of consumer assessments ex ante, there should arguably not be any differences in average ratings for the same product across different platforms. Also, rating distributions on a 1 to 5 scale often exhibit a relatively high number of 1- and 5-star ratings, resulting in a J-shape distribution, whereas the actual population distribution tends to follow a normal distribution (Hu et al. 2017). Theoretically, if rational consumers were aware that such a pattern existed they should be able to integrate this into their decision making (e.g., Sun 2012). Empirically, however, consumers are often bounded in their rationality. Even if they were aware of such patterns, it has been shown that they would still not be able to fully account for them when making their decisions (Hu et al. 2017). As a result, such informational inefficiencies can have a considerable impact on the reduction of information asymmetry of review systems, impeding their optimal functioning. Reasons for such inefficiencies stem from (1) drivers of online reviews and (2) the design of review systems.

For the purpose of this dissertation, drivers of online reviews are defined as all those external factors that influence the generation of reviews and ratings (Gutt et al. 2019b). In the literature, these drivers are often referred to as biases[3] (e.g., Hu et al. 2017), especially when they affect ratings. For example, ratings on Airbnb are often overly positive because hosts and guests on the platform exhibit a reciprocity bias when rating each other (Bolton et al. 2013; Zervas et al. 2020). Consequently, reciprocal behavior is a driver of online reviews that manifests in positively biased ratings on Airbnb. Further, the previously presented pattern of the J-shape distribution is partially driven by the preference bias (Hu et al. 2017; Li and Hitt 2008). Consumers buying the product generally exhibit a higher preference for it and thus give higher ratings than those that decide not to buy it. In case of the preference bias, consumer preferences constitute a driver of online reviews.

[3] As per standard dictionary definition, I refer to the term "bias" as "a tendency or inclination of outlook; a subjective point of view" (Merriam-Webster 2021). One could also understand biased ratings as ratings that deviate from the "actual quality" of a product. However, "actual quality" is often limited to a theoretical perspective because factors related to taste contribute to perceptions of quality that differ across consumers (Hu et al. 2017), making "actual quality" hard to grasp.

The key difference between sharing product information offline and reviewing a product online is that the latter involves information technology (IT), which means that we share our review with potentially millions of unknown website visitors (e.g., Yelp 2021) instead of only face to face with a person known to us. Taking this process online therefore changes the motivation and behavior of senders and receivers of this information compared to private offline conversations (Chen 2017; Wojnicki and Godes 2017). Further, the design of the IT artifact (in this case, the review system) has, as with all information systems (Hevner et al. 2004), a substantial impact on the outcomes produced by this system. Each individual design feature of a review system can moderate the impact that one or more drivers can have on online reviews and consequently strengthen or weaken informational inefficiencies. For instance, the differences in ratings between Airbnb and TripAdvisor can be attributed to differently designed review systems (Zervas et al. 2020). Reciprocal behavior can only occur if hosts and guests review each other, which is allowed by the design of Airbnb but not of TripAdvisor. In this case, introducing mutual reviewing as a design feature contributes to an upward bias (Bolton et al. 2013). As another example, implementing a multi-dimensional rating system, which offers separate ratings for each product feature, instead of a single-dimensional one helps consumers find products that better match their taste and thus yields generally higher and less dispersed ratings (Chen et al. 2018). As a result, the number of rating dimensions moderates the impact of the preference bias.

As shown in the above example of multi-dimensional rating systems, the impact of review system design is not restricted to reviewers but also extends to readers of reviews and therefore also moderates the impact that reviews have on economic outcomes. Merely aggregating all ratings into a single average rating—as is the case for Yelp—incentivizes sellers who have reached a high average to exploit their reputation (Aperjis and Johari 2010; Dellarocas 2005), for example by employing a ‘milking strategy’ (Mir Djawadi et al. 2018). This involves sellers using their high average rating as a quality signal to lure in consumers before lowering their product quality to reap the benefits of keeping a high price while enjoying lower costs. Again, this informational disadvantage on the side of the consumer can be overcome by making a different design choice, namely implementing a *reputation discontinuity* mechanism, i.e., a measure which accounts for changes in product quality when displaying reviews or when aggregating ratings. One such measure, deployed by eBay, for example, involves introducing a reputation discontinuity mechanism that calculates the average rating only for a limited time span, e.g., 12 months, in the case of eBay (Dellarocas 2005; Aperjis and Johari 2010).

Given the crucial role of drivers and design features for the effectiveness of review systems in reducing information asymmetry, a substantial amount of research has emerged over the last 20 years, aimed at (1) identifying the drivers of online reviews and (2) evaluating the design features of review systems. Moreover, the current state of knowledge has been consolidated in literature reviews and meta-analyses, both on the impact of online reviews on sales (e.g., Floyd et al. 2014; Babić Rosario et al. 2016) and of drivers on online reviews (Hong et al. 2017; King et al. 2014). However, in light of the richness of this

body of knowledge, it is surprising that, at the time of writing, we lack a systematic literature review that consolidates the knowledge on review system design and its moderating effect on the impact of drivers on reviews, as well as on the impact of reviews on economic outcomes. Therefore, to address this gap in the body of knowledge, the first study included in this thesis (Gutt et al. 2019b) provides a synthesis of the current literature on this topic.

In Gutt et al. (2019b), we not only give a systematic overview of research on review system design, but also uncover gaps in the current body of knowledge, which opens up important avenues for subsequent research in this area. As a result, this dissertation also contributes to two of the identified gaps.

The first gap arises from the fact that review systems are constantly being modified by established platform owners introducing new design features. Despite the growing amount of research analyzing these changes, there is an increasing need to understand the impact of novel design features and those that have been proposed by prior work, but not yet analyzed. Review systems have to be increasingly tailored to the specific characteristics of their market setting and their product range. For instance, markets where product quality can change over time, such as the restaurant industry or the market for smartphone apps, make older reviews less relevant or redundant. As a result, prior research has suggested to account for or even to remove these outdated reviews in different ways (Moreno and Terwiesch 2014; Ghose 2009) but has not yet followed up with an empirical analysis on how such a feature affects economic outcomes. Therefore, this dissertation contributes to understanding specific reputation discontinuity mechanisms, which are designed to mitigate the informational inefficiencies stemming from simply aggregating all ratings and displaying outdated reviews.

Second, there is little knowledge on the role of review systems in different review environments, namely two-sided review environments, B2B review environments, and review environments characterized by an offline-online interaction. For example, it is unclear how a consumer's offline environment should be incorporated into review system design (Gutt et al. (2019b). Even more so, it has been found that this knowledge gap extends to drivers and economic outcomes of reviews as well (Gutt 2019), suggesting an overall lack of knowledge on geographical dynamics (e.g., a consumer's current offline location or local market competition) in the literature on online reviews. Consequently, this dissertation aims to contribute to this gap by (1) analyzing the informational inefficiencies in review systems that stem from a consumer's offline location and (2) revealing economic consequences of informational inefficiencies for markets that exhibit geographical dynamics.

This dissertation addresses our lack of knowledge regarding (1) a consolidated view on review system design, (2) reputation discontinuity mechanisms as a design feature, and (3) the impact of consumers' offline locations on ratings and economic outcomes, with four research studies. The first study synthesizes, as outlined above, the current state of research on review system design. The research gaps we identify in this study (Gutt et al. 2019b) serve as the starting point for the subsequent studies of this

dissertation. The second study (Gutt et al. 2020) examines how reputation resetting affects the economic performance of software products. We analyze a market for smartphone apps and investigate how the resetting of an app's reputation, which can be either driven by the seller themselves or by the platform, affects its sales. In the third study (Neumann et al. 2021), we analyze how a consumer's offline location (i.e., whether they are reviewing as a traveler or as a local) affects their online ratings by empirically analyzing observational data from TripAdvisor and Yelp. As a result, we uncover biases in online ratings driven by geographical dynamics. In the final study (Neumann 2021), I develop an analytical model to investigate economic consequences of biased ratings such as their impact on price setting or consumer surplus. Particularly, this model captures variety-seeking tendencies, which means that consumers have an intrinsic desire to switch between sellers for the sake of variety. Consumers exhibit such tendencies, among others, on markets connected to the restaurant and leisure industry, which are markets that also exhibit geographical dynamics. Therefore, the results of this model analysis shed light on the economic consequences of the biases revealed in the third study.

The findings of this dissertation contribute to our knowledge on the reduction of information asymmetry through the implementation of review systems and our understanding of how these systems should be designed to support their market function. In so doing, we also advance behavioral theory on consumer evaluations by connecting Self-Enhancement Theory (Shrauger 1975) with Self-Distancing Theory (Kross and Ayduk 2017) and by demonstrating that—contradicting prior literature (Maglio et al. 2013)—different psychological distances do not always affect these evaluations in the same way. Further, I contribute to both economic theory on online reviews (e.g., Kwark et al. 2014) and on variety-seeking behavior (e.g., Zeithammer and Thomadsen 2013) by deriving novel propositions from an analytical model. Finally, we also establish review systems as strategic information systems based on the resource-based view of the firm (Barney 1991).

The remainder of this dissertation is structured as follows: In Section 2, I describe the fundamental theoretical principles that explain the role of review systems in markets. Section 3 presents the current state of knowledge leading up to the three central research gaps addressed by this dissertation. In Section 4, each study included in this dissertation is outlined alongside the individual contributions of all co-authors as well as the scientific presentations and publications associated with it. In Section 5, I reflect on the research methodology employed throughout this dissertation. I conclude with Section 6 by presenting the theoretical implications, practical contributions, and limitations of each study as well as by providing directions for future research.

2. Theoretical Background

The central theoretical construct which underlies research on review systems is information asymmetry. Akerlof (1970) outlines how information asymmetry can turn a market into a 'market for lemons'. Scrutinizing a market for used automobiles, he explains that information asymmetry can lead to market failure. New cars have known probabilities q of being high-quality and $1 - q$ of being low-quality (being a "lemon"). Car owners can only discover the true quality of their car over time. Buyers of new and used cars, however, cannot assess whether a car is of high or low quality. This information asymmetry implies that both low- and high-quality cars are sold for the same price. A new car must be more valuable than a used car. Otherwise, owners of a low-quality car could trade their car for a new one and have a new shot at getting a high-quality car. As a result, the owners of a high-quality used car cannot ask for a price equal to their car's true value, because it is less valuable than a new car. They leave the market causing the probability of encountering a lemon on the market to increase beyond $1 - q$. This implies that high-quality sellers cannot even receive their car's expected value. Because of this, high-quality sellers are driven out of the used car market, causing consumers to leave the market as well. Ultimately, the market fails.

Even prior to Akerlof's (1970) seminal analysis of asymmetric information, Harsanyi (1967, 1968a, 1968b) laid the foundation for the study of information asymmetry with game theoretic models (Chen et al. 2020; Gul 1997). A game of incomplete information (Harsanyi 1967, 1968a, 1968b) introduces different types of players (e.g., sellers of high- and low-quality cars). Players do not know what type the other players are, but they do know their own type and have a subjective probability distribution regarding the type of others (e.g., beliefs regarding whether a seller has a high- or low-quality car). The introduction of this type of game essentially allows to conduct an equilibrium analysis (Nash 1950) for any game with information asymmetry (Gul 1997).

Akerlof (1970) demonstrates that markets need to be designed so that consumers are provided with reliable information regarding the better-informed party of the market and thus have trust in their trading partner. Naturally, this is not restricted to used car markets, but even more so, important for digital markets where transactions often occur between strangers, over a geographical distance, and sequentially (e.g., payment in advance) (Chen et al. 2020). One way to achieve this provision of information is by letting the better-informed parties of the market signal their quality. This is postulated by the well-established Signaling Theory (Spence 1973). The problems arising from information asymmetry can be overcome if high-quality sellers are able to obtain a signal that allows consumers to distinguish between high- and low-quality sellers. This signal needs to be costly to obtain for low-quality sellers and at the same time enable high-quality sellers to earn sufficiently high profits. Formally, this is the case if, for high-quality sellers, the payoff from obtaining a signal is *higher* than the payoff

from not obtaining a signal. Simultaneously, for low-quality sellers, the payoff from obtaining a signal needs to be *lower* than the payoff from not obtaining the signal. (Connelly et al. 2010)

From a Signaling Theory perspective, the reviews with their texts and numerical ratings as well as the aggregated metrics provided by the system represent signals that inform consumers about quality (Li and Hitt 2010). The same signals can also inform them about consumers' individual taste match (Chen et al. 2018; Hong and Pavlou 2014). This information may otherwise be unknown to them. If posted reviews would always be unbiased and truthful, they would allow consumers to derive perfectly accurate information. This in turn would make it impossible for a low-quality seller to obtain a signal indicating high-quality in the review system without raising the quality of their own goods. Consumers could then rely on these signals and incorporate them into their decision making. Incorporating the perspective of a game with incomplete information (Harsanyi 1967, 1968a, 1968b), one can conclude that these signals alter the subjective probability distribution that consumers share about the types of products offered by a seller. Naturally, this is also the case for signals that are inaccurate and might lead consumer decisions astray, such as biased ratings.

Economic models have incorporated these perspectives when studying online reviews. Some models assume that past buyers post truthful reviews, allowing later consumers to derive accurate information for their purchase decision (e.g., Li and Hitt 2010, Zimmermann et al. 2018). Others, however, introduce inaccuracies in online reviews. For instance, the taste match information in reviews can be modelled so that reviews signal the correct taste match with a certain probability and the quality information can be represented by a numerical value, which does not necessarily represent the true underlying quality and may be biased (Kwark et al. 2014, 2017).

Game and Signaling Theory provide the classical theoretical foundation for the study of online reviews from an *economic* perspective. However, to understand how and why online reviews exhibit biases, as outlined in the previous section, it is also necessary to rely on additional theories, which often focus on the *behavioral* aspects of individuals. For instance, the reciprocity bias introduced by allowing mutual reviewing between buyers and sellers (Bolton et al. 2013) can be explained by the well-established Reciprocity Theory (Falk and Fischbacher 2006). Because both parties in the transaction fear retaliation after providing a negative review, each resorts to giving a positive review regardless of the experience. In a similar way, to study how sharing word-of-mouth online instead of offline affects consumer behavior, prior studies (Chen 2017; Dubois et al. 2016) have employed Self-Enhancement Theory (Shrauger 1975). The latter postulates that individuals strive to maintain a positive self-view, which, in the context of reviews, means that consumers prefer to post positive reviews instead of negative ones to convey to others that they have, for example, made a smart purchase decision. Analyzing online reviews from any behavioral perspective will always require the consideration of a multitude of theories stemming from a range of domains such as psychology and marketing.

As demonstrated above, researching online reviews requires a comprehensive understanding of economic theory and behavioral insights. In line with this, Chen et al. (2020) postulate that designing efficient review systems necessitates the interplay between economic theory, behavioral economics, and empirical research. Chen et al (2020) consider review system design an act of market design because it fulfils the definition provided by Kagel and Roth (2020) of design involving 'not only […] marketplaces but also […] other economic environments, institutions and allocation rules' (Kagel and Roth 2020, p. 290). In contrast to mechanism design, market design complements the rationality assumptions of economic theory by accounting for irrational behavior explained by behavioral economics and analyzed through empirical research (Chen et al. 2020). The studies belonging to this dissertation embrace this notion since they, as a whole, cover all three of the aforementioned aspects, namely economic theory, behavioral economics, and empirical research (see Table 1).

Table 1: Interplay between Economic Theory, Behavioral Economics, and Empirical Research in this Dissertation

Study	Economic Theory	Behavioral Economics	Empirical Research
Gutt et al. (2020)	Application of Game Theoretical Model on Reputation Resetting (Kovbasyuk and Spagnolo 2018)	-	Field Data Analysis
Neumann et al. (2021)	-	Self-Enhancement Theory (Shrauger 1975) Self-Distancing Theory (e.g., Kross and Ayduk 2017)	Field Data Analysis
Neumann (2021)	Development and Analysis of Game Theoretic Model	Variety-Seeking Behavior (e.g., Kahn 1995) Biases in Consumer Evaluations (e.g., Williams et al. 2014)	-

Note: Gutt et al. (2019b) builds on theory in strategic management and cannot be assigned to the three aspects of market design as suggested by Chen et al. (2020). Still, it provides a synthesis of literature belonging to all three of those areas.

3. Body of Knowledge

3.1 Conceptual Model

To give an overview of the rich body of knowledge on online reviews, I present the conceptual model introduced in Gutt et al. (2019b) (see Figure 1). In general, online reviews consist of a numerical rating (e.g., star rating from 1 to 5) and a textual review, while some review systems also offer additional metrics, such as, for example, on an individual review level, helpfulness as voted by readers, on an aggregate level, average rating or the number of reviews, and, on a reviewer level, reviewer reputation. The conceptual model presents three constructs, namely drivers, economic outcomes, and design of review systems, which share either a direct or an indirect relationship with numerical ratings, textual reviews, and/or metrics. First, many studies have investigated the impact of online reviews on *economic outcomes*, depicted by arrow (a) in Figure 1. This effect can occur on a consumer level (e.g., higher rating increases willingness to pay, Wu et al. 2013), firm level (e.g., higher number of reviews increases sales, Duan et al. 2008), and market level (e.g., ratings indicating true quality increase market efficiency, Dellarocas 2003). Second, there is research on the *drivers* of online reviews (arrow (b) in Figure 1). I refer to drivers as all external factors that affect ratings, review texts, and metrics. Drivers can be review-related (e.g., higher prior ratings affect the current reviewer's rating, Muchnik et al. 2013) or reviewer-related (e.g., preferences of reviewers increase ratings of early reviews, Li and Hitt 2008). Finally, the *design of review systems* moderates the two prior relationships. For instance, allowing mutual reviewing moderates the impact of reciprocity as a driver of reviews (arrow (d) in Figure 1, e.g., Bolton et al 2013). Similarly, calculating the average rating based on only the latest ratings instead of all ratings moderates the impact of online reviews on market efficiency (arrow (c) in Figure 1, e.g., Aperjis and Johari 2010). Apart from these two design features of review systems, there are many more features that have been analyzed by research.

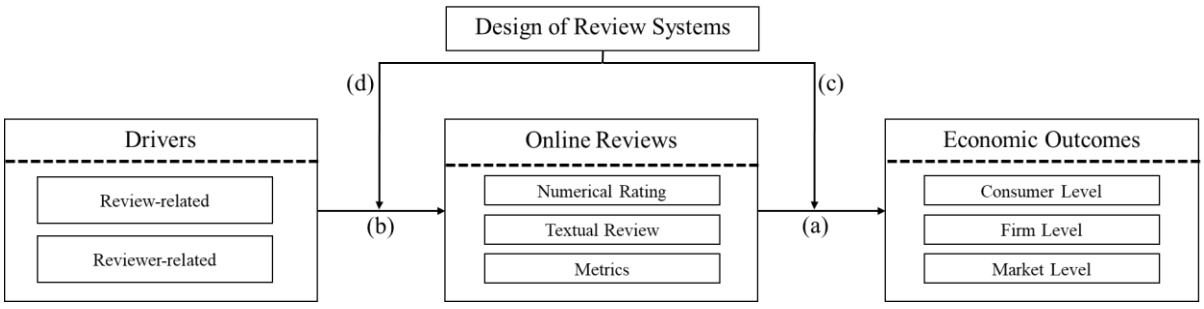

Figure 1: Conceptual Model of Existing Online Review Research as in Gutt et al. (2019b)

3.2 Existing Reviews of the Literature

Before outlining the research gaps this dissertation contributes to, I present prior studies that have either synthesized existing studies on online reviews or conducted a meta-analysis of the studies. Table 2

provides an overview of these reviews and the meta-analyses. It classifies the constructs they analyzed according to the four components of the conceptual model in Figure 1. The section proceeds by first presenting the literature reviews and then the meta-analyses.

Table 2: Literature Reviews and Meta Analyses on Online Reviews

Study	Type of Study	Analyzed constructs corresponding to drivers	Analyzed constructs corresponding to reviews itself	Analyzed constructs corresponding to economic outcomes	Analyzed constructs corresponding to design
Cheung and Thadani (2012)	Literature Review		*Stimuli* (e.g., Valence, Volume) *Communicators* (e.g., reviewer expertise)	*Responses* (e.g., Attitude, Purchase Intention)	
King et al. (2014)	Literature Review	*Antecedents of Senders* (e.g., Self-Enhancement)	*eWOM Characteristics* (e.g., Volume, Valence, Variance) *Consequences for Senders* (e.g., Reviewer Reputation Gain)	*Antecedents of Receivers* (e.g., Search/Evaluation Efforts) *Consequences for Receivers* (e.g., Willingness-to-Pay, Trust)	*eWOM Characteristics* (Reviewer Reputation Systems, Anonymity)
Tadelis (2016)	Literature Review	Product Quality *Biases* (e.g., Underreporting, Reciprocity)	Valence	Prices Sales Repeated Purchases	*Some Basic Features* (Treating no feedback as positive, Mutual Reviewing, Text Mining to Improve Seller Ranking)
Matos and Rossi (2008)	Meta-Analysis	*Antecedents* (e.g., Satisfaction, Perceived Value)	Valence Volume		
Floyd et al. (2014)	Meta-Analysis		Valence Volume	Sales	
You et al. (2015)	Meta-Analysis		Valence Volume	Sales	
Babić Rosario et al. (2016)	Meta-Analysis		Valence Volume Variance	Sales	
Hong et al. (2017)	Meta-Analysis	*Review-related Factors* (e.g., Readability, Review Age) *Reviewer-related Factors* (e.g., Reviewer Expertise, Expert Label)	Usefulness		

Note: The general terms used by the authors to summarize constructs are shown in italics. Studies are presented in order of (1) type of study and (2) date of publication.

The extant literature reviews have adopted different perspectives. Cheung and Thadani (2012) employ the Social Communication Framework (Hovland 1948) focusing on *communicators, stimuli, receivers*, and *responses*. In terms of my conceptual model (Figure 1), their synthesis covers studies concerning the relationship between online reviews and their economic outcomes from a consumer perspective. As a result of their synthesis, they derive multiple propositions describing how their framework's components relate to each other, for example they postulate that "eWOM volume is positively associated with purchase intention" (Cheung and Thadani, 2012, p. 465). King et al. (2014) take on a slightly different perspective in their literature review by structuring the body of knowledge into a 2x2 matrix distinguishing between antecedents and consequences of reviews as well as between senders and receivers of reviews. The quadrant *antecedents of senders* describes aspects that drive consumers to publish a review. *Consequences for senders* resulting from publishing a review can mainly be described as a gain in their own reputation as a reviewer, which is information that is often displayed next to a review. *Antecedents of Receivers* can be seen as all those reasons that consumers have for reading reviews such as a lower search cost. The resulting impact of reviews on readers, such as higher willingness-to-pay, is captured by the quadrant *Consequences for Receivers*. The latter two quadrants both cover benefits of reviews for consumers, which is why I classified them as references to economic outcomes of reviews. For each of these quadrants, the authors synthesize the literature covering various *eWOM characteristics*, such as valence or volume. The literature review by Tadelis (2016) aims to give an overview of the impact of reviews on online marketplaces and therefore presents studies describing the positive impact of valence on economic outcomes. The author further discusses current issues of review systems stemming from biases and review system design, such as the reciprocity bias.

Overall, the extant literature reviews focus on studies analyzing the relationships between drivers, reviews, and economic outcomes. Studies analyzing the design of review systems are mostly neglected in these reviews, with the exception of a few studies investigating specific design features, e.g. studies on reviewer reputation systems and anonymity, which are mentioned in the review by King et al. (2014). In contrast to the other literature reviews, Tadelis (2016) places a stronger emphasis on the review system itself, and describes design features such as mutual reviewing and handling buyers who do not leave a review. However, Tadelis does not make review system design the central focus of his review, as indicated by the author referring to design merely as *some basic features*.

Similarly, the meta-analyses focus either on the impact of reviews on sales or on the impact of drivers on reviews, but neglect review system design. Floyd et al. (2014), You et al. 2015, and Babić Rosario et al. (2016) confirm the positive impact of valence and volume on sales and find platform types and product characteristics influencing these relationships. Focusing on the drivers of online reviews, Matos and Rossi (2008) conduct a meta-analysis of multiple antecedents of the propensity to post reviews, and find that quality, for instance, is positively correlated with reviewing intentions. Also focusing on drivers of reviews, Hong et al. (2017) present a meta-analysis of the antecedents of online review helpfulness, revealing inconsistent results for constructs like review readability or reviewer expertise, for example.

3.3 Research Gaps

Having examined all prior literature reviews and meta-analyses, I conclude that, despite the substantial impact that design features can have on the well-researched relationships between drivers, reviews, and economic outcomes, a comprehensive synthesis of the literature on review system design is still missing. For instance, the previously explained reciprocity bias is arguably negligible if the review system design does not allow for mutual reviewing (e.g., Bolton et al. 2013). Similar to the study by Bolton et al. (2013) on mutual reviewing, there is a multitude of studies investigating the moderating impact of design features like management responses (e.g., Proserpio and Zervas 2017), review elicitation (e.g., Cabral and Li 2015), and more. With the increasing amount of such research explicitly studying design features (e.g., Li and Hitt 2010; Jiang and Guo 2015; Li 2017) and the multitude of studies on online reviews proposing the introduction of not yet analyzed design features (e.g., Kwark et al. 2014; Moreno and Terwiesch 2014; Zimmermann et al. 2018), there is an evident need for such a literature review to inform research and practice on the current body of knowledge as well as to guide future research towards novel avenues with a research agenda. Accordingly, I formulate the following research gap:

Gap 1: There is no review of the literature on the design of review systems.

The first study of this dissertation addresses this gap by conducting a systematic literature review. As a result of the corresponding synthesis of the literature, we identify three overarching research gaps:

1. “Multiple design features for review systems have not yet been analyzed.” (Gutt et al. 2019b, p. 110)
2. “The design of review systems for different environments is under-investigated.” (Gutt et al. 2019b, p. 111)
3. “The design of review systems for different devices is under-investigated.” (Gutt et al. 2019b, p. 112)

The remaining studies of this dissertation contribute to two specific research gaps, which both represent a subarea of the first two overarching gaps cited above, and identified in Gutt et al. (2019b).

First, there are numerous design features that have been proposed by prior literature, but without having been analyzed yet. These suggestions generally stem from the implications generated by studies on the drivers or economic outcomes of reviews. As a result, research should be dedicated to evaluating and expanding upon these suggestions. Design features that have been proposed and discussed, for example, include reputation discontinuity mechanisms, whereby changes in product quality are considered when aggregating and displaying reviews. Prior studies suggest that review systems need to give a greater weighting to recent reviews (Dai et al. 2018; Ghose 2009), while others argue for a complete removal of old reviews (i.e., reputation resetting, Moreno and Terwisch 2014). Old reviews might no longer reflect the current product quality and may even prevent sellers whose products had previously received negative reviews from surviving in the market even after having improved their products' quality. In stark contrast with this view, some studies propose to actively promote older reviews despite potential quality changes because, in line with studies on psychological distance, they can be perceived as more helpful if the reader's purchase decision or consumption is lying further ahead in the future (Jin et al. 2014). Studies on review system design have contributed to this discussion by analyzing types of mechanisms referred to as Window Aggregation Mechanisms (Aperjis and Johari 2010) that only display the latest k reviews (Dellarocas 2005, Aperjis and Johari 2010). They provide theoretical evidence that it is optimal for market efficiency if reviews are aggregated on a fixed time window. However, these findings focus only on market level outcomes and on dishonest behavior by sellers. They do not consider the impact of reputation discontinuity, and more specifically reputation resetting, on individual types of sellers. Most notably, there is no empirical analysis of reputation resetting mechanisms, which remove a product's full review history when its quality has changed. Therefore, I conclude that there is a knowledge gap regarding the understanding of such reputation discontinuity mechanisms and their impact on economic outcomes.

Gap 2: There is a lack of knowledge about the impact of reputation discontinuity mechanisms on economic outcomes.

Second, the offline-online interaction of a consumer's review environment is an important avenue for future research that needs to be addressed (Gutt et al. 2019b). This gap is not limited to review system design but extends to the entire body of knowledge on online reviews (Gutt 2019). Before analyzing the moderating impact of review system design in this context, it is therefore necessary to first understand the underlying relationships between the local offline environment as a driver of reviews and the resulting economic outcomes. In this context, prior research has analyzed the impact of reviewers' cultural backgrounds on their reviewing behavior (Fang et al. 2013; Hong et al. 2016; Koh et al. 2010). Other empirical studies have been conducted on the impact of local market competition on

rating distributions (Gutt et al. 2019a), on the volume of reviews (Liu et al. 2018), and on fake reviews (Luca and Zervas 2016; Mayzlin et al. 2014). Moreover, it has been shown that location-based augmented reality apps used in local markets increases the volume of reviews for businesses close to the app's marked locations (Pamuru et al. 2020).

Understanding the role of a consumer's geographic location for their reviewing behavior is central to this research gap. Forman et al. (2008) show that, when reviewers share the same geographic location, it increases the positive impact of reviews on sales. A reviewer's geographic location gains additional meaning in the context of local stationary industries like restaurants and shopping malls. In this case, geographical location creates a natural segmentation between local reviewers and traveling reviewers. If this segmentation introduces biases into review systems, aggregated review metrics and rankings based on these metrics will strongly differ between businesses that predominantly attract locals and those that predominantly attract travelers, contributing to an uneven competition between these businesses. Huang et al. (2016) present results suggesting a positivity bias in ratings exhibited by reviewers who review a restaurant from both a geographical and a temporal distance. Kokkodis and Lappas (2020) expand upon this finding by showing a city popularity bias for restaurant ratings. According to their results, travelers exhibit a positivity (negativity) bias if their hometown has a lower (higher) popularity (operationalized as the number of hotel reviews posted in these towns) compared to the popularity of the reviewed restaurant's location. While these studies provide first insights into the impact of a consumer's offline location on their online reviewing behavior, there are still several aspects to be addressed. First, the theoretical lenses employed by these studies have been developed in an offline context. However, taking consumer evaluations to the online context might require additional theoretical reasoning. As a result, there is a lack of theoretical understanding regarding the interaction between consumers' offline environment and online reviewing behavior. Second, markets that create geographical heterogeneity amongst consumers are also prone to specific consumer behavior such as variety-seeking (Ariely and Levav 2000; Kahn 1995) or transaction utility considerations induced by travel costs (Spiekermann et al. 2011; Thaler 1983). These behavioral patterns may influence the role of geographic locations in the online review context but have not been studied in the online review literature. Finally, the extant literature in this stream of research does not consider how biases stemming from the offline-online interaction affect the economic outcomes of reviews. Consequently, the third research gap reads as follows:

Gap 3: There is insufficient knowledge on the impact of a reviewer's offline location on their online reviewing behavior and on the economic outcomes of reviews.

The scarcity of knowledge on the offline-online interaction is of particular concern in light of the surge of such research in other areas of information systems research. For instance, it has been shown that one's online purchasing behavior decreases when a local store opens in one's hometown (Forman et al.

2009) and that consumer surplus increases if a local store expands its business to the online channel (Nault and Rahman 2019). Similarly, the local competition of offline lending institutions affects consumers' online peer-to-peer lending behavior, with more competitive markets causing borrowers to pay off their online peer-to-peer debt earlier (Alyakoob et al. 2021).

4. Overview and Contribution

The aim of this dissertation is to contribute to the three aforementioned research gaps. To this end, I present four research papers that form the core part of this dissertation. In these papers, I employ a wide range of research methods. In the first (Gutt et al. 2019b), we conduct a scoping literature review (Paré et al. 2015) and give a comprehensive overview of research on review system design. The three subsequent research papers are built on the rich body of knowledge identified during the literature search, which does not only feature work on review system design but also on drivers and economic outcomes of reviews.

In the second paper (Gutt et al. 2020), we focus on advancing our understanding of review system design by examining the economic consequences of reputation resetting. We empirically analyze the market for Apple apps where, at the time of data collection, updating one's app is associated with a removal of the app's review history. This mechanism has been implemented to account for potential quality changes and thus aims to ensure that all reviews concern the current version of the app. Leveraging the impact that the platform owner's update of the operating system has on developers' need to update their apps, we find that platform-driven reputation resetting benefits those developers that have a negative reputation (as their sales ranking decreases), but is detrimental to developers with a positive reputation, because their sales ranking increases as a result of the resetting.

Having revealed the overall lack of knowledge on the impact of a consumer's offline location (Gutt et al. 2019b), in our third paper, we conduct an empirical analysis of restaurant reviews (Neumann et al. 2021). We find that psychological distance induced by a consumer reviewing as a traveler or as a local is associated with a positivity as well as a negativity bias in online ratings. As a result, this raises questions on how these biases manifest in economic outcomes and whether they are detrimental for consumers: Does a psychological distance bias impede consumer decision making and does it allow sellers to exploit these inaccuracies? Are consumers worse off in terms of consumer surplus due to these biases?

Given that consumers in markets with geographical heterogeneity (e.g., restaurants, shopping, arts and entertainment, and nightlife) often exhibit variety-seeking behavior, I present an analytical model that I used to analyze the economic impact of online ratings in such markets. The analysis reveals how biased ratings affect prices, profits and consumer surplus under variety-seeking behavior and therefore sheds more light on the economic impact of the biases reported in the third study. Amongst other things, the results of the analysis suggest that positively biased ratings can benefit consumer surplus, whereas negatively biased ratings harm consumer surplus.

Table 3 presents the submitted research papers with their corresponding research question(s), methodology, data source and their classification according to Figure 1.

Table 3: Classification and Properties of Submitted Studies

Research Gap	Study	Research Question(s)	Methodology	Data Source	Classification according to Conceptual Model (Figure 1)
Gap 1: Consolidated View on Review System Design	Gutt et al. (2019b)	What is the state-of-the-art in review system design? What are the remaining research gaps in review system design? What are promising ways to close the research gaps?	Scoping literature review	Articles published in top journals from multiple disciplines	Design moderates: Drivers → Reviews Design moderates: Reviews → Economic Outcomes
Gap 2: Reputation Discontinuity Mechanisms	Gutt et al. (2020)	What is the effect of a reputation resetting mechanism on app demand? How does the role of the platform and prior app reputation influence this relationship between reputation resetting and app demand?	Fixed effects regression, instrumental variables regression	Apple app store, appannie.com	Design moderates: Reviews → Economic Outcomes
Gap 3: Reviewer Offline Location	Neumann et al. (2021)	How does psychological distance in spatial and temporal dimension affect the online evaluations of negative consumer experiences?	Fixed effects regression, clustering	TripAdvisor.com, Yelp.com	Drivers → Reviews
	Neumann (2021)	How do online ratings affect market outcomes if consumers are variety-seeking?	Analytical Modeling	-	Reviews → Economic Outcomes

In the remainder of this section, I give a summary of each research paper, provide information on each author's individual contribution, and give details on the scientific dissemination of each work.

4.1 Gutt et al. (2019b)

In this study, we synthesize the literature (Webster and Watson 2002) on review system design. We establish that decisions regarding review system design are strategic choices that impact reviewing behavior and economic outcomes, turning these systems into strategic information systems. To classify the extant literature, we develop a research model (see Figure 1) that demonstrates how design features moderate the relationships between (a) drivers and reviews, and between (b) reviews and economic outcomes. With the aim of conducting a scoping review (Paré et al. 2015), we manually searched through all issues of 38 reputable journals, between 1991 and 2017, from various domains such as marketing, information systems, and operations management. We coded the list of the 312 papers on online reviews identified during this search according to our research model. This list is not limited to research on system design but also contains studies that analyze drivers or economic outcomes. As a result of the synthesis, we identify three research gaps. First, we find that many studies have proposed design features as an implication of their analysis of drivers or economic outcomes. However, many of these features (e.g., review templates) have not been studied thoroughly. Additionally, there are novel design features implemented by established review systems (like Amazon's Q&A feature) that have gained little scholarly attention. Second, we identified several distinct review environments, namely B2B environments, two-sided reviewing environments, and environments characterized by an online-offline interaction. The unique features of each of these environments challenge the existing results obtained in the traditional B2C environment. For instance, reviewer anonymity should affect reviewing behavior in a B2B setting because the name of the reviewer's employer can be presented next to their review, which might be problematic in case of a negative review. Finally, we postulate that there is a lack of research on the different devices used for writing reviews such as speech-controlled devices. For each of these research gaps, we provide an agenda to encourage further research.

Table 4: Gutt et al. (2019b): Joint Work, Presentations Scientific Dissemination

Joint Work	Co-authorship with D. Gutt, S. Zimmermann, D. Kundisch and J. Chen (30% D. Gutt, 30% J. Neumann, 16% S. Zimmermann, 16% D. Kundisch, 8% J. Chen) ▪ Concretization of the research question jointly by all authors ▪ Positioning of the paper jointly by all authors ▪ Literature collection jointly with D. Gutt, S. Zimmermann and D. Kundisch ▪ Development of the conceptual model jointly with D. Gutt, S. Zimmermann and D. Kundisch ▪ Interrater coding jointly with D. Gutt, S. Zimmermann and D. Kundisch ▪ Statistical evaluation of interrater agreement by D. Gutt ▪ Additional interrater coding by N. Krüger and M. Müller (student assistants) ▪ Write-up of paper jointly with D. Gutt, S. Zimmermann and D. Kundisch ▪ Write-up of the response to the reviewers and editors jointly with D. Gutt ▪ Feedback, comments, and corrections by S. Zimmermann and D. Kundisch
Presentations	▪ This work has not been presented so far.
Scientific Dissemination	▪ The work on this paper was started in May 2017. ▪ The proposal for this paper was initially submitted to the **Journal of Strategic Information Systems** in June 2017. ▪ An earlier version of this paper was published in the dissertation by Gutt (2019). ▪ The paper was published in the **Journal of Strategic Information Systems**, (VHB Jourqual 3 ranking: A) in June 2019 after three rounds of revisions.

4.2 Gutt et al. (2020)

With this study, we investigate how reviews affect sales under a platform regime that ties product updates to reputation resetting. Specifically, we examine data from a market for smartphone apps (the Apple app store) where each update has the potential of changing an app's functionality, for example, displaying the weather forecast instead of the current time. Therefore, the platform has implemented a mechanism that resets an app's review history (including all aggregated metrics) every time its developer releases a new update. The platform also releases a yearly update of its own operating system, which makes subsequent updates to certain apps necessary to ensure their operational stability. This allows us to study platform-driven reputation resetting and compare it to deliberate reputation resetting (i.e., driven by developers releasing regular updates). Operationalizing reputation with the number of reviews an app has accumulated, we find that platform-driven resetting has a negative (positive) impact on the sales of apps that had a relatively high (low) reputation prior to their update. For updates that are

released deliberately by the developers, our results suggest that they are associated with an increase in sales regardless of an app's reviews prior to the reset. Counter to intuition, we also find that developers do not seem to strategically align their updating (and thus resetting) behavior with updates to the platform's operating system update. These findings inform platform owners on the consequences of their review system design. We can conclude that the presence of this design feature does not keep the platform's contributors (i.e., developers) from improving their contributions (i.e., apps). However, although this design feature was introduced with the intention of keeping reviews updated as well as accurate, its interaction with the platform's own behavior (in form of updates to the operating system) negatively affects its most reputable contributors.

Table 5: Gutt et al. 2020: Joint Work, Presentations Scientific Dissemination

Joint Work	Co-authorship with D. Gutt, W. Jabr and D. Kundisch (30% D. Gutt, 30% J. Neumann, 25% W. Jabr, 15% D. Kundisch) ▪ Literature review jointly by all authors ▪ Concretization of the research question jointly by all authors ▪ Positioning of the paper jointly by all authors ▪ Identification of background and hypotheses development jointly with D. Gutt ▪ Data collection from Apple App Store and AppAnnie by W. Jabr ▪ Data preparation jointly with D. Gutt ▪ Empirical analysis jointly with D. Gutt ▪ Write-up of paper jointly by all authors ▪ Write-up of the response to the reviewers and revision of the paper jointly with D. Gutt ▪ Feedback, comments, and corrections by W. Jabr and D. Kundisch
Presentations	▪ Gutt, D., Neumann, J., Jabr, W., Kundisch, D. 2019. The App Updating Conundrum: Implications of Platform's Rating Resetting on Developers' Behavior, in: **Proceedings of the 40th International Conference on Information Systems (ICIS)**, Munich, Germany. ▪ Gutt, D., Neumann, J., Jabr, W., Kundisch, D. 2020. The Fate of the App – Economic Implications of Updating under Reputation Resetting, contribution at: **Business Information Management Department Research Seminar, Erasmus University Rotterdam**, Rotterdam, Netherlands (presented by D. Gutt).
Scientific Dissemination	▪ The work on this paper started in March 2018. ▪ An earlier version of this paper is published in the proceedings of the **International Conference on Information Systems (ICIS)** 2019 (VHB Jourqual 3 ranking: A). ▪ The paper was initially submitted to **Information Systems Research** in May 2020. ▪ The paper is currently in preparation for resubmission (reject with opportunity to resubmit) to **Information Systems Research**, (VHB Jourqual 3 ranking: A+).

4.3 Neumann et al. (2021)

In this study, we analyze the role of a reviewer's geographical location (i.e., whether they are reviewing as local or as traveler) and the psychological distance it induces for their online ratings. From reviewing the literature, we conclude that the positive relationship between being a traveler and one's rating that has been established by prior literature (Huang et al. 2016) relies on Construal Level Theory (Trope and Liberman 2010), which suggests that feeling psychological distance, i.e., temporal or spatial distance towards a past experience, results in a more abstract representation of that experience. However, by building on insights from Self-Enhancement Theory and Self-Distancing Theory, we theorize that the online setting of reviewing an experience also introduces a negativity bias. In particular, we hypothesize that the sentiment of the experience moderates the positive relationship postulated by Construal Level Theory with negative sentiment weakening this relationship. To test this hypothesis, we empirically analyze two comprehensive datasets of restaurant reviews from TripAdvisor.com and Yelp.com. Our results from a multi-way fixed effects regression analysis suggest that, apart from the already established positivity bias exhibited by travelers, we also observe a negativity bias. In case of a negative experience, travelers indeed give lower ratings than locals. Conducting an extensive textual analysis, we are able to attribute this finding to the psychological distance felt by travelers, which enables them to overcome the need to protect their self-view from sharing negative experiences online with others. We also find that this relationship only holds for the dimension of spatial distance but not for temporal distance, which challenges the common understanding that both of these distances are mentally conceptualized in the same way (Maglio et al. 2013). These results support review system designers in their efforts to de-bias ratings and adjust their rankings. We also contribute to theory by being the first to combine Self-Enhancement Theory and Self-Distancing Theory to advance our understanding of the impact of psychological distance on online consumer evaluations.

Table 6: Neumann et al. (2021): Joint Work, Presentations Scientific Dissemination

Joint Work	Co-authorship with D. Gutt and D. Kundisch (60% J. Neumann, 30% D. Gutt, 10% D. Kundisch) ▪ Literature review jointly with D. Gutt ▪ Concretization of the research question jointly by all authors ▪ Positioning of the paper jointly by all authors ▪ Identification of theoretical background and hypotheses development by J. Neumann ▪ Data collection jointly with D. Gutt ▪ Data preparation and textual analysis by J. Neumann ▪ Provision of geocodes using the MapQuest API by N. Krüger (student assistant) ▪ Empirical analysis by J. Neumann ▪ Write-up of paper jointly with D. Gutt ▪ Write-up of the response to the reviewers and revision of the paper jointly with D. Gutt ▪ Feedback, comments, and corrections by D. Kundisch
Presentations	▪ 06/2017: Neumann, J., Gutt, D., Kundisch, D. 2017. The Traveling Reviewer Problem – Exploring the Relationship Between Offline Locations and Online Rating Behavior, contribution at: **Fakultätsforschungsworkshop** in Lippstadt, Paderborn University. (presented by D. Gutt and J. Neumann). ▪ 11/2017: Neumann, J., Gutt, D., Kundisch, D. 2017. The Traveling Reviewer Problem – Exploring the Relationship Between Offline Locations and Online Rating Behavior, contribution at: **Topics in Economics and Management (TEAM)**, Paderborn University. (presented by D. Gutt). ▪ 11/2017: Neumann, J., Gutt, D., Kundisch, D. 2017. The Traveling Reviewer Problem – Exploring the Relationship Between Offline Locations and Online Rating Behavior, contribution at: **INFORMS Annual Meeting**, Houston, USA. ▪ 12/2017: Neumann, J., Gutt, D., Kundisch, D. 2017. The Traveling Reviewer Problem – Exploring the Relationship between Offline Locations and Online Rating Behavior, in: **Proceedings of the Thirty Eighth International Conference on Information Systems (ICIS)**, Seoul, South Korea. ▪ 02/2018: Neumann, J., Gutt, D., Kundisch, D. 2018. The Traveling Reviewer Problem - Exploring the Relationship Between Offline Locations and Online Rating Behavior, contribution at: **Workshop IS Design and Economic Behavior (ISDEB)**, Lüneburg, Germany. (presented by D. Kundisch and D. Gutt). ▪ 06/ 2018: Neumann, J., Gutt, D., Kundisch, D. 2018. The Traveling Reviewer Problem - Exploring the Relationship Between Offline Locations and Online Rating Behavior, contribution at: **Symposium on Statistical Challenges in Electronic Commerce Research** (**SCECR**), Rotterdam, Netherlands. (presented by D. Gutt).

Scientific Dissemination	▪ The work on this paper started in December 2016. ▪ An earlier version of this paper was published in the proceedings of the **International Conference on Information Systems (ICIS)** 2017 (VHB Jourqual 3 ranking: A). ▪ An earlier version of this paper was published in the dissertation by Gutt (2019). ▪ The paper was initially submitted to **Management Information Systems Quarterly (MIS Quarterly)** in August 2020. ▪ The paper is currently under review (after one round of major revisions) at **Management Information Systems Quarterly (MIS Quarterly)**, (VHB Jourqual 3 ranking: A+).

4.4 Neumann (2021)

In this study, I investigate the economic impact of online ratings in markets where consumers have an intrinsic desire for variety. This means that consumers, driven by curiosity or boredom, switch between products or sellers just for the sake of variety. In these markets, online ratings are particularly important because consumers need to frequently assess the quality of alternative offerings. I develop a two-period analytical model to study such a market. In this model, I let consumers experience a diminished utility from consuming the same good a second time and introduce (potentially biased) online ratings that inform consumers about product quality in the second period. The analysis of this model reveals that if intrinsic variety-seeking tendencies are sufficiently strong, low-quality sellers have a higher incentive to improve their rating. Further, I find that dynamically adjusting one's price to one's rating is increasingly profitable with increasing intrinsic variety-seeking behavior. These results inform sellers on when to invest in reputation management instead of customer retention measures, and how profitable it can be to reduce menu costs. Finally, I find that, in case of strong intrinsic variety-seeking, positively biased ratings increase consumer surplus, whereas negatively biased ratings decrease it. This is because any increase in a seller's rating is associated with an increase in prices and in variety-seeking consumers coming from competitors, which contributes to a decrease in consumer surplus. However, this price increase also leads to more consumers leaving for the competitor. Further, it leads to the competitor decreasing their price. This, in contrast, has the effect of contributing to an increase in consumer surplus, which outweighs the previously described decrease. The findings of this study inform sellers operating in such markets on the benefits of reputation management and of dynamic rating-based pricing. The counterintuitive finding of biased ratings benefitting consumers supports review system designers in their de-biasing strategies. This result gains further importance in light of the discovery, in Neumann et al. (2021), of a negativity bias in the restaurant market (see 4.3). According to the model analysis presented in Neumann (2021) and the strong variety-seeking tendencies found in the restaurant industry (Ha and Jang 2013), the negativity bias exhibited by travelers decreases consumer surplus of local consumers, whereas the positivity bias established by prior literature does not.

Table 7: Neumann (2021): Joint Work, Presentations Scientific Dissemination

Joint Work	Single authored paper
Presentations	▪ 11/2018: Neumann, J. The Economics of Online Reviews in Markets with Variety-Seeking Consumers, contribution at: **INFORMS Conference on Information Systems and Technology (CIST)**, Phoenix, USA.
Scientific Dissemination	▪ The work on this paper started in January 2018. ▪ The paper was initially submitted to **Marketing Science** in May 2021. ▪ The paper is currently under review (first round) at **Marketing Science**, (VHB Jourqual 3 ranking: A+).

5. Reflection on Methodology

In this section, I reflect on the research methods employed in the research papers of this dissertation. In particular, I describe the main drawbacks associated with the choice of these methods. I also explain how these drawbacks have affected the analyses conducted in the studies and the measures taken to mitigate them.

Any research endeavor should incorporate a review of prior literature (Webster and Watson 2002). The central challenge of any literature review is to present a critical review of prior work and provide a research agenda to guide future research (Rowe 2014), rather than merely summarize the literature. To conduct a thorough and rigorous literature review, different types of review methodologies are available, each entailing its own advantages and drawbacks. Paré et al. (2015) presents nine types of literature reviews in information systems research, each of which can be assigned to a specific overarching goal. Following this typology, the literature review conducted in Gutt et al. (2019b) has been designed and executed as a *scoping review* with the overarching goal of 'aim[ing] to summarize the extant literature […] to provide […] a broad and comprehensive background for understanding a current state of knowledge' (Paré et al. 2015, p. 185). This goal is suitable to address the first research gap of this dissertation, which calls for a comprehensive review of the literature. *Narrative reviews* and *descriptive reviews* also share this goal. According to Paré et al. (2015), the former lack a comprehensive and systematic search strategy. The latter impose a pre-defined theoretical framework and restrict their search to empirical research in order to identify trends and patterns supporting or contradicting this framework. Scoping reviews also include conceptual and analytical research into their synthesis (Paré et al. 2015), which suits the case of research on review system design with its wide range of theories and research methods. Central drawbacks regarding this type of review are rooted in (1) the effort required to achieve comprehensiveness (Paré et al. 2015), and (2) the difficulty of assessing article quality (Levac et al. 2010). We were able to overcome the first drawback by investing enough effort into conducting a comprehensive issue-by-issue search strategy for 38 scientific journals and a supplemental keyword search. Additionally, following the advice by Daudt et al. (2013) to involve at least two persons in the coding of articles, we got graduate student assistants to code the articles of a subset of these journals and found sufficiently high intercoder reliability with our own assessments. Indeed, the effort required to get every journal article coded by multiple persons would have been too large, but employing this procedure to a subset still lent further support to the comprehensiveness of our literature search. Regarding the second drawback (the difficulty of assessing article quality), we relied on several established lists of high-quality journals to select articles of sufficiently high quality. Even though this approach has led to the exclusion of a substantial number of articles (e.g., grey literature and conference proceedings), it helped to manage the effort required to conduct this review, while also ensuring that the articles discussed in our literature review meet the quality requirement.

In Gutt et al. (2020) and Neumann et al. (2021), we rely on an empirical analysis of observational data. Dealing with such data is accompanied by concerns regarding (1) establishing causality (e.g., Angrist and Pischke 2009), and (2) identifying the underlying theoretical mechanism (e.g., Beach 2013). Naturally, an ideal way to establish causality is by running an experiment (Bhattacherjee 2012). In the context of Gutt et al. (2020) and Neumann et al. (2021), this would mean designing an experiment that allows to manipulate a seller's reputation (e.g., as in He and Bond 2015) or a reviewer's perceived psychological distance (e.g., as in Henderson et al. 2006). However, the advantage of analyzing observational data over conducting an experiment lies in the increase in external validity (Bhattacherjee 2012). In Gutt et al. (2020), we were able to address endogeneity concerns by identifying the platform's OS updating behavior as a natural experiment. The instrumental variables approach, which is suitable for such a case (Angrist and Pischke 2009), allows us to identify the local average treatment effect of reputation resetting for the compliers, i.e., those developers who update their app because they are affected by the OS update. However, there still remains the concern that developers self-select into or out of the need to update (and thus into or out of the reset of their reputation). While developers have little to no influence over the platform updating policy, they might nevertheless anticipate their need to update and thus try to actively influence the effect of the platform update, for instance by releasing a feature update simultaneously. To mitigate this concern, we were able to identify developers that align the release of new app features with their app updates by conducting a textual analysis of the release notes accompanying an update. In the case of Neumann et al. (2021), establishing causality with observational data was not possible. The spatial and temporal distance that we can observe remains the result of endogenous decisions made by reviewers. However, we were able to adjust our regression analyses to rule out alternative explanations for our results. Similar to prior research on psychological distance and online reviews (Huang et al. 2016), we employ a multi-way fixed effects regression that accounts for time-invariant reviewer and business heterogeneity. Most importantly, to ensure that our results are not driven by travelers patronizing different types of restaurants when compared to locals, we were able to restrict our sample to chain restaurants with reviewer-chain fixed effects, and to introduce a clustering approach on an additional dataset from a second platform.

Regarding the identification of the theoretical mechanism, the information contained in review texts often allows to obtain insights on behavioral aspects of consumers, which enables researchers to provide further evidence on the mechanism when testing behavioral theories. Here, research on online reviews can rely on psychology and psycholinguistics (e.g., Pennebaker et al. 2015) and on methods of textual analysis in information systems research (e.g., Müller et al. 2016). In the case of Neumann et al. (2021), we were able to provide evidence for the underlying mechanism by analyzing review texts for use of self-referential language, which has been shown to be an indicator for self-distancing behavior (Kross and Ayduk 2017). Even though the textual analysis we employed is a standard dictionary-based approach instead of a more sophisticated one, it still exhibits the advantage of having a connection with

the theoretical construct of self-distancing, which has been established by prior literature. In Gutt et al. (2020), we were less concerned with behavioral aspects of reviewers. More important to our findings is the behavior of potential buyers and their underlying decision-making process. This information could not be derived from our data, but we could rely on the many prior studies that have already established the positive impact of high reputation on sales.

Developing an analytical model allows researchers to derive propositions that can be used to predict market outcomes. That is why many studies investigating the economic outcomes of online reviews develop such analytical models (e.g., Kwark et al. 2014; Li and Hitt 2010). Following this approach allowed me (1) to study the impact of biases in online ratings by developing an analytical model, and (2) to contribute to the economic theory on online reviews. A central criticism regarding analytical modeling is a lack of realism (Bichler et al. 2016). In this case, one could argue that the assumption of rationally acting market participants is unreasonable. In direct contradiction to this criticism, and in line with the suggestions by Bichler et al. (2016), I was able to incorporate empirically identified regularities, for example variety-seeking behavior of consumers (e.g., Kahn 1995), into the model developed in Neumann (2021). Furthermore, I was able to account for irrational behavior, for example sellers exhibiting bounded rationality in their price setting (Che et al. 2007) and consumers relying on biased ratings (Hu et al. 2017). Empirically validating the propositions of this model is left to future research, since it would require data from multiple markets with different levels of intrinsic variety-seeking behaviors. Such a validation would further boost the realism of this model.

Overall, we were able to strengthen the rigor and validity of the studies in this dissertation by addressing the methodological drawbacks in multiple ways, namely (1) using empirical approaches to establish causality or to rule out alternative explanations, (2) employing textual analyses to provide evidence for theoretical mechanisms, and (3) incorporating model components that contribute to the realism of the analytical model.

6. Conclusion

The studies compiled in this dissertation advance our understanding on the informational inefficiencies that stem from biases in online reviews and on the moderating role of the design of review systems in overcoming such biases. The negativity bias in the reviewing behavior of travelers revealed in this dissertation suggests that the impact of one's offline environment on one's online behavior (Neumann et al. 2021) goes beyond the findings built on theoretical considerations developed solely in the offline context (Huang et al. 2016; Trope and Liberman 2010). The economic impact of such biases is substantial but also heterogenous (Neumann 2021). In markets where consumers exhibit variety-seeking tendencies (e.g., Kahn 1995), the existence of a negativity bias can be detrimental to consumer surplus, whereas a positivity bias can even be beneficial to consumer surplus (Neumann 2021). There exists a rich body of literature on review system design and the important role that design features play in alleviating or enhancing the occurrence and the economic impact of biases in general (Gutt et al. 2019b). Reputation resetting as a form of reputation discontinuity is one such design feature that substantially influences the relationship between online reviews and sales (Gutt et al. 2020). Nevertheless, there are still many other interesting and relevant design features to be analyzed in future research, especially when taking into account different review environments and devices (Gutt et al. 2019b).

6.1 Contribution and Implications

Contribution to Research and Theory

The results presented in Neumann et al. (2021) challenge the commonly accepted positive relationship between psychological distance and consumer evaluation (both in an offline and online context) established by research in psychology and marketing (e.g., Huang et al. 2016; Weingarten and Berger 2017). Therefore, the contribution of this work is not limited to information systems research but extends to consumer psychology and marketing as well. We also contribute to theory, as we are, to the best of my knowledge, the first to theoretically integrate Self-Enhancement Theory (Shrauger 1975) and Self-Distancing Theory (Kross and Ayduk 2017). This theoretical advancement is rooted in the unique setting that arises from taking word-of-mouth online in the form of online reviews. While prior literature has focused on Construal Level Theory (Trope and Liberman 2010)—a theoretical foundation that considers consumer evaluations articulated in an offline setting—the fact that online reviewing involves sharing an experience with (potentially millions of) others has required additional theoretical considerations. In this way, this dissertation also implies that taking on an information systems research perspective, for instance by considering the unique properties of the online context, can foster the development of theories created in other domains, such as psychology. Also, in contrast to prior literature postulating that different dimensions of psychological distance share a similar meaning and a common mental conceptualization (Maglio et al. 2013), we show that these dimensions can still lead to

different outcomes in the online context. In this way, we answer the call by Maglio (2020) for more research on divergent effects of different psychological distances.

The theoretical model I present in Neumann (2021) interweaves two well-established streams of research. First, I contribute to economic theory on market outcomes under variety-seeking behavior (e.g., Sajeesh and Raju 2010; Zeithammer and Thomadsen 2013) by introducing asymmetric information and online ratings. Vice versa, I contribute to economic theory on market outcomes in the presence of online reviews (e.g., Kwark et al. 2014, Li 2017) by introducing variety-seeking tendencies. I also contribute to the discussion on the difference between intrinsically motivated variety seeking (also referred to as *true variety-seeking*) and externally motivated variety-seeking (also called *derived varied behavior*) (e.g., van Trijp et al. 1996; Sajeesh and Raju 2010) by analyzing ratings as a cause for an increase in observable variety-seeking in the market. By connecting marketing-oriented models, economics of information systems and behavioral theory I was able to generate not only novel insights but also counterintuitive results. The results inform existing and future studies that reveal biases in online ratings on the implications of these biases for markets.

Taken together, the results of Neumann et al. (2021) and Neumann (2021) demonstrate that, as suggested by Chen et al. (2020), a combination of behavioral economics, empirical research, and economic theory is necessary to design review systems. Without the economic analysis I present in Neumann (2021), it would have remained unclear whether the positivity and negativity biases exhibited by travelers (Neumann et al. 2021) always impair consumer decision making and decrease consumer surplus. The exposure of the heterogenous effects of these biases strengthens the contribution of Neumann et al. (2021) and adds to the importance of the research gap on the interplay between offline environments and online behaviors identified in Gutt et al. (2019b).

The results presented in Gutt et al. (2020) rely conceptually on the analytical model by Kovbasyuk and Spagnolo (2018) and thus add validity to their model setup. We also present a novel perspective on negative outcomes of reputation discontinuity mechanisms, which opposes the otherwise predominantly positive outcomes regarding market efficiency suggested by and found in prior research (Aperjis and Johari 2010, Moreno and Terwiesch 2014, Dai et al. 2018).

The contribution of (Gutt et al. 2019b) is not limited to the provision of a comprehensive overview of the literature and the development of a research agenda, as we also examine review system design through a lens of strategic decision making. We consider review systems as specialized assets according to the resource-based view of the firm (Barney 1991) and argue for the theoretical viability of our proposed research agenda, taking a strategic perspective. The view which postulates that online reputation lends a competitive advantage, has also been empirically validated by later research (Taeuscher 2019). Since the publication of this paper, more research on review system design has been published which contributes to closing the research gaps identified by our literature review. For

instance, Teubner et al. (2019) analyze reputation portability as a novel design feature within a two-sided review environment, and Pamuru et al. (2020) analyze the interaction between the offline and the online environment by studying the relationship between using an augmented reality app and online reviewing behavior, to name but a few.

All in all, each research paper in this dissertation relies on theories from a variety of domains outside of information systems, namely psychology, marketing, strategic management, and economic theory. Each study contributes novel insights to these theories by (1) empirically validating theoretical considerations, (2) integrating multiple theoretical perspectives to generate novel insights, and/or (3) validating theories in a new context. This is consistent with the notion that information systems research is not dominated by a single theory (Bichler et al. 2016).

Implications for Practice

My dissertation provides practical implications for review system owners, sellers and consumers as well as market regulators. Both sellers, who employ review systems on their websites, and third-party review platforms can benefit from the insights generated by this dissertation. The comprehensive overview of review system design (Gutt et al. 2019b) supports them in choosing appropriate design features for their system and assessing the consequences of their design choices. In addition to this overview, we also present practical insights on the consequences associated with implementing a reputation resetting mechanism (Gutt et al. 2020). The existence of biases in online ratings by travelers (Neumann et al. 2021) informs review system owners, especially third-party platforms, that standard aggregation mechanisms like displaying the average leads to the presentation of biased metrics. Often, literature uncovering such a bias suggests de-biasing to improve consumer decision making. Kokkodis and Lappas (2020), for instance, suggest that the ranking employed by a review system should account for how much a restaurant is affected by the bias they find and thus adjust its ranking accordingly. However, this dissertation also reveals that de-biasing might not always be beneficial for consumers because not all biases lead to a decrease in consumer surplus (Neumann 2021). Consequently, taking this into consideration when developing a de-biasing strategy is important for any review system owner. As platforms actively elicit reviews, they should also be aware of the impact of psychological distance on ratings. For instance, Google Maps Reviews often asks consumers for a review some time after they have navigated to a business (Carney 2019). According to our findings in Neumann et al. (2021), these ratings vary systematically depending on the spatial and temporal distance of the consumer at the time of the elicitation.

My results suggest that sellers can adjust their decision making to realize higher profits (Neumann 2021). First, they can set their prices in response to a change in their online rating. According to my findings, the potential loss from neglecting ratings in their pricing grows with the variety-seeking tendencies of consumers in the market. This implies that, for instance in the restaurant market, measures

to reduce menu costs like the digitalization of the ordering process should be implemented to reap the benefits of dynamic price setting based on online ratings. Second, sellers should consider the results of this dissertation in their online reputation management. I identify market scenarios that inform low- and high-quality sellers on whether to invest in customer retention measures or in online reputation management depending on the variety-seeking tendencies of the consumers in the market (Neumann 2021). Moreover, the systematic overview of the effects of design features also carries merits for sellers (Gutt et al. 2019b). If system owners, for instance, decide to introduce management responses into their review system, sellers arguably need to know how to interact with this design feature to improve their reputation (Proserpio and Zervas 2017; Wang et al. 2020). Furthermore, being aware of a positivity bias that, according to prior literature, exists between psychological distance and online ratings (e.g., Huang et al. 2016), sellers might aim to selectively elicit reviews from travelers. However, this strategy might backfire due to the presence of a negativity bias associated with psychological distance for negative experiences (Neumann et al. 2021).

Being the less-informed party in transactions that need to rely on online reviews, consumers can also benefit from the findings of this dissertation. When making a consumption decision regarding a local offline business, they should incorporate potential biases (Neumann et al. 2021) into their decision making, to avoid reducing their individual consumer surplus (Neumann 2021). They should also be aware of the consequences of review system design features that are presented in our literature review (Gutt et al. 2019b). For instance, knowing that multidimensional rating systems help to make better decisions on a product or service (Chen et al. 2018) is valuable information for deciding which review system provider to use. This knowledge is also helpful for market regulators aiming to protect consumers. For instance, the US Federal Trade Commission (FTC) has decided that any reviewer, who received some form of compensation for their review, needs to openly communicate their relationship with the seller (FTC 2021). Given that this review elicitation is associated with a positivity bias (Cabral and Li 2015; Neumann and Gutt 2019), it is important to know whether or not such a bias poses a problem in terms of its effect on consumer surplus (Neumann 2021).

6.2 Limitations

Like with every research, there are limitations to the studies in this dissertation. Despite the rigor of our literature search (Gutt et al. 2019b), there are outlets that we did not consider due to the scope of our study. For instance, several studies on online reviews are published in conference proceedings (e.g., Fradkin et al. 2015; Gutt et al. 2017; López and Farzan 2014), which cannot be identified through our literature search strategy. Still, each of the other research papers contains an individual literature overview that also considers these outlets.

Further, the research gap referring to the offline-online interaction in review environments has been originally identified with the aim of studying design features that account for such interactions (Gutt et

al. 2019). Even though the two studies related to this gap (Neumann et al. 2021; Neumann 2021) carry implications for review system design, they do not directly investigate design features of specific review systems. Although an analysis of the body of knowledge identified during our search has revealed that this gap extends to drivers and outcomes of reviews as well (Gutt 2019), these two studies do not directly contribute to research on review system design, but provide further design implications for review environments with offline-online interactions.

Each of the various methodologies applied in the research papers of this dissertation also has its own drawbacks. First, the empirical analysis of TripAdvisor and Yelp reviews that we conduct (Neumann et al. 2021) can ultimately not rule out that reviewers decide themselves whether and where to travel as well as whether and when to review, even though we employ several empirical strategies to make restaurant visits by travelers comparable to those by locals. Second, although the analytical model I have developed and the corresponding model analysis (Neumann 2021) considers bounded rationality and aims to incorporate plausible decision making of market participants, these findings remain theoretical until they can be empirically validated. Third, similar to the case of reviewers choosing where to dine and when to review, in our study on reputation resetting (Gutt et al. 2020) we are unable to observe developer decision making and their intentions behind their updating strategies.

6.3 Avenues for Future Research

Future research can build on the insights of my research. First, the above limitations could be addressed by employing different research methodologies. An experimental study, for example, could add to the internal validity of Neumann et al. (2021) and shed more light on the role of psychological distance in reviewing behavior by actively manipulating perceived psychological distance (e.g., as in Henderson et al. 2006). An analysis of real-world data could add validity to the propositions developed in Neumann (2021). A supplemental survey study directed towards app developers could provide further insights and complement our empirical strategy to extend the results presented in Gutt et al. (2020).

Second, we present a comprehensive research agenda that outlines open research areas on review system design (Gutt et al. 2019b). One large area that still needs to be investigated and has not yet been touched upon in this dissertation is the area of devices that are used to write and post a review. Despite the emergence of first research in this area, for instance, focusing on chat-bot mediated reviewing (Tsekouras et al. 2020), the increasing importance of speech-controlled devices such as smart speakers (Wright 2020) needs to be met with more research on review system design that takes account of these devices. Given that prior research has already shown first systematic differences between written and oral word-of-mouth communication in private conversations amongst consumers (Berger and Iyengar 2013), the oral word-of-mouth introduced by speech-controlled devices requires novel design features to account for differences in the content of written and oral reviews but also in their impact on their readers or listeners.

Third, since we have shown that resetting one's reputation upon a product update does not affect all market participants equally and that it can lead to unintended interactions with the platform's updating policy, future research should be dedicated to developing and analyzing novel variants of reputation discontinuity measures that can overcome these drawbacks. For instance, research could evaluate reputation resetting policies that allow for an optional, rather than a mandatory, reset after an app update. In such a case, developers' reputation resetting becomes an additional strategic decision that accompanies every update. Given that rating aggregation mechanisms and reputation resetting are necessary because product quality can change over time, research should support practitioners by developing reputation discontinuity mechanisms that enable platform designers to reliably identify actual changes to quality across different market types (e.g., digital and physical goods, online and offline markets).

Finally, the findings pertaining to the offline-online interaction (Neumann et al. 2021; Neumann 2021) demonstrate the significant impact of offline circumstances on online reviewing behavior and on associated economic outcomes, setting the stage for future work to develop and evaluate design features to further address this research gap. In line with the call by Chen et al (2020) and following Neumann (2021), research developing analytical models to study online reviews could more actively incorporate behavioral economics. Given that we revisit an established relationship and apply a novel theoretical lens to account for the online context (Neumann et al. 2021), our results should encourage future research to pursue a similar avenue and challenge commonly accepted relationships within but also outside the research stream on online reviews.

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