The Freemium Effect: Why Consumers Perceive More Value with Free than with Premium Offers

Completed Research Paper

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Abstract

Continuous evolution of digital technology not only changes the way people communicate, it also fundamentally alters how companies generate revenue. Services like Dropbox, Skype, LinkedIn or Spotify successfully implement the freemium business model of concurrent free and priced premium versions. This paper will investigate the consequences of offering basic features for free. Based on research complementing the relationship between quality and price, the following provides evidence for an inversed "freemium" effect. Free services provide more value than premium services, not less. Results from a set of experimental studies show that consumers perceive fewer sacrifices and more benefits with free rather than premium offers. Consequently, decision-making variables (value, intention, and willingness to pay) favor the free versions. Implications for practice and research are provided building upon these results.

Keywords: E-Business, Business Model, Consumer Decision-making, Electronic Commerce, Price Analysis

Introduction

New business models are an enduring and vital topic in IS research and practice (e.g., Bharadwaj et al. 2013; Hedman and Kalling 2003; Watson et al. 2010). From a business perspective, this "evolution of the marketplace" (Varadarjan and Yadav 2009, p. 11) has not only changed the way people communicate, but the way companies generate revenues as well. As consumers have changed their online consumption behavior, companies have changed their business models to capitalize accordingly. For example, consumers spend nearly 60 hours a week with social networking and consuming content such as music, books, pictures, or videos (Nielsen 2014). In line with this, ventures like Dropbox (300 million users), Skype (600 million), LinkedIn (350 million), Spotify (50 million), or formerly Last.fm (before it discontinued its radio streaming service last year) provide access to online services for millions of users (all data self-declared as of March 2015). From a consumer's perspective, all of these examples fall under the "freemium" category, which describes a business model "in which a website offers most of its services for free while restricting only some premium features to fee-paying consumers" (Oestreicher-Singer and Zalmanson 2013, p. 592). Consequently, the free service mainly aims at providing a user base that attracts non-users to join the community via network externalities (e.g., Agarwal et al. 2008; Asvanund et al. 2004; Bateman et al. 2011). Further, while using the service, consumers develop advanced needs and integrate the service into their lives, which may lead to a paid premium feature upgrade (Kumar 2014; Lee et al. 2013). For example, Dropbox users consume the free cloud-based storage (e.g., 2 GB) for private photos, expand their usage to other media (e.g., videos), and share more data with friends and colleagues. At some point, their needs und usage patterns exceed the current amount of storage provided, which in turn fosters the adoption of subscription-based storage expansions (upselling to e.g. 100 GB). Inherently not revenue-generating, free services have to rely on other types of revenues (ads, referrals) and also help to reduce consumers' reservations and improve consumer loyalty with the company, which can lead to cross-selling of other services and products or allow new features to be tested (Kumar 2014). Finally, features and price setting of free and paid versions enable multiple strategic options in competition (e.g., skimming or market penetration; Spann et al. 2015).

The growing literature on freemium has focused on two streams of research so far: IS-related (e.g., Oestreicher-Singer and Zalmanson 2013) and management-related literature (e.g., Papies et al. 2011). In essence management-related, our approach contributes to both research streams. In addition to external motives of using free services (e.g., social acceptance-driven), core features of the free version itself influence the behavior of users. We complement previous research and the conventional wisdom that more or better features of the priced version generate benefits which in turn justify the price. A set of two studies provide ample evidence that the underlying mechanisms influencing perceived sacrifice (what do I have to give up?) and perceived quality (what benefits do I get in return?) inversely shape the consumers' value perception: free services likely provide more value than paid services, not less, since the zero price effect itself produces benefits and dilutes sacrifices. Investigated only in traditional retail contexts, these effects have so far not been established for online communities and digital services and products. Since the evolution of the Internet has promoted perceptions that digital services and products should belong to the Internet community and thus be free (Lin et al. 2013), we propose that this "freemium effect" reinforces the value of free services. As a result, knowing how price perceptions frame the value of freemium services also helps to understand how features of free and paid versions are evaluated and how they shape consumers' decisions to use either versions. Consequently, by showing the consequences of a freemium effect, our research contributes to the opportunities of e-Business and social commerce, as recently highlighted by Yadav et al. (2013).

We structure the paper as follows: First, both streams of research, IS and management research, are reviewed. We then continue with theoretical considerations based on traditional and new approaches of value perception that are subsequently used to derive our research framework. In the next step, an initial experimental study will explore how users of the music-streaming service Spotify value different offers. As a consequence of some limitations to this first study, we report the findings of our main study which investigates the freemium effect's consequences of two main features (price, storage) for the cloud-based storage service Dropbox on the basis of an experiment. Finally, implications for practice as well as limitations of our research and an outlook for future research are provided.

Literature review of freemium research

IS research

IS and management research on freemium differ in their research focus. While IS research investigates intentions and willingness to pay (WTP), management research adds attention to companies' strategic options. IS research on the topic can be traced back more than ten years. In a principal study, Ye et al. (2004) support the utilitarian view that perceived value with various online services (e.g., email, news, weather, and sports websites) improves WTP for these services instead of using free variants. In addition, usage intensity is found to be an important motive for most services (except email, travel and news). Further, Choi et al. (2009) show that adopting a fee-based service instead of a free version is primarily influenced by the satisfaction with the service. Social aspects rank third behind benefits. In contrast, a study investigating factors that frame the WTP for music-streaming services indicates that price was the most important decision aspect by far (Doerr et al. 2010). Another factor that has been investigated in IS research is the "free mentality" trait of whether a consumer considers music as a commodity with the right of free disposal (Lin et al. 2013). Users with a high degree of this mentality perceive a stronger sacrifice when a premium service was offered and consequently have a more negative attitude towards paying as well as less intention to do so. In contrast to previous findings, Oestreicher-Singer and Zalmanson (2013) have found that the probability to pay for an online service (Last.fm) is increased by consumption (e.g., songs played), organization (e.g., playlist creation), and social features (e.g., subscribing friends). Remarkably, and in contrast to the utilitarian view, community-driven features are more important than inherent features, supporting previous findings that network externalities improve usage, engagement and sharing in online communities (e.g., Agarwal et al. 2008; Asvanund et al. 2004; Bateman et al. 2011). Overall, WTP-influencing factors range from value perceptions (Choi et al. 2009; Ye et al. 2004) to social perceptions (Choi et al. 2009; Oestreicher-Singer and Zalmanson 2013). As an additional note, the scarce literature on this topic is inconsistent. Only one potential moderator between freemium perception and evaluation (free mentality, Lin et al. 2013) could be identified.

Management research

Early management research on the topic (Pauwels and Weiss 2008) investigates the consequences of altering the strategy from an ad-based free offer to fee-based subscriptions. This decision is primarily shaped by the trade-off between revenues through subscription fees and advertising. This is consistent with Papies et al. (2011) who compare the motives for free, ad-funded, and paid music downloads. However, cannibalization effects between strategies (e.g., moving from a freemium to an ad-based strategy) are low. Moreover, consumers who dislike advertising perceived ad-funded offers as being less attractive, contributing a second possible moderator between freemium perception and evaluation. Two studies explore the quantitative value of freemium offers. The free version of a cloud-based storage service generates a value of $2 per user and month, largely produced (65%) by references (Lee et al. 2013). This is in line with the WTP for hypothetical premium versions of free services (Facebook, Google) using van Westendorp's (1976) pricing method (Schreiner and Hess 2013). The optimal price (which represents the price most people find acceptable) ranges from €1.52 for Google to €1.67 for Facebook. Finally, the functional fit between free and premium services moderates the decision to adopt the premium service (Wagner et al. 2014). In other words, if the user perceives only small functional differences between both versions (high fit), he will be less likely to have a positive attitude towards the premium offer and will be less likely to pay for it. Summarizing management research on the topic, freemium services possess a WTP that is greater than zero (Lee et al. 2013; Schreiner and Hess 2013) and enable multiple strategic options (Papies et al. 2011; Pauwels and Weiss 2008). In addition to IS research, two possible moderators of the consequences of freemium perception (attitude towards advertising, Papies et al. 2011; perceived fit between free and premium version, Wagner et al. 2014) are introduced.

Comparing both streams of research, a common theme is the influence of different factors framing users' intentions and WTP. Contributing to this user-oriented view, and to the best of our knowledge, we add another perspective not yet captured: the fundamentals regarding how users develop value perceptions of free and premium offers in a freemium business model. In order to achieve this goal, we continue with our theoretical framework in the next chapter.

Theoretical framework of causes and consequences of users' value perceptions

Quality and sacrifice as causes of value perception

Because the concept of value is vital for product evaluation and consumption (e.g., Zeithaml 1988) early works on value perception can be found in economic and marketing literature in particular. Value perception, the consumer's assessment of the attribute value (what I get for what I give?; Zeithaml 1988), which can also be equated with outcome (or surplus, Turnovsky et al. 1980) from an economics perspective (Kahneman and Tversky 1979). So value perception is a trade-off driven by two perceptions of perceived quality (what benefits do I get in return?) and perceived sacrifice (what do I have to give up?; e.g., Dodds et al. 1991; Zeithaml 1988). Quality in this context is commonly understood as an evaluation of objective (e.g. functions) and subjective (e.g. social acceptance) benefits while sacrifice is consistently equated with price as a monetary expense (e.g., Dodds et al. 1991; Monroe and Krishnan 1985; Zeithaml 1988). In economic terms, quality is equal to gains (also referred to as *value*), while sacrifices equal losses (also referred to as *cost*, or in monetary form, *price*; e.g., Kahneman and Tversky 1979). However, consumers do not evaluate both independently. Based on the initial works of Scitovsky (1945), extensive literature assumes a positive relationship between quality and price (quality-price relationship). That is, consumers are assumed to use the given price as an indicator of quality, since the quality of a product is not easily observable in many cases. Multiple moderators can nevertheless influence the quality-price relationship (Rao and Monroe 1988; Voelckner and Hofmann 2007; Zeithaml 1988). These include other attributes (e.g., packaging), variances of prices and qualities in the respective product category (e.g., wide range of products), or consumer attributes (e.g., price awareness, capability to detect quality differences). Another limitation in this context is the dual role of price as an objective attribute influencing quality perception in the one role and as the apparent manifestation of perceived sacrifice in the other. Unexpected value perceptions can as a result occur if price is a strong indicator of quality, but perceived as a small sacrifice (e.g., high income of the consumer) – and vice versa (Voelckner and Hoffmann 2007).

Zero price effect

A central application of this dual role of price is the so-called the "zero price effect" (ZPE, Shampanier et al. 2007). A price of zero (e.g., the free offer) not only reduces the perceived sacrifice, it also improves the quality, i.e. the associated attributes with the offer, in three ways. First, the free offer invokes norms of social exchange (no monetary obligation) rather than norms of market exchange (monetary obligation). Since social exchange norms are often considered to be more positive (Fiske 1992), this evaluation is translated to the object which triggered it. In terms of freemium, and in line with previous findings (Oestreicher-Singer and Zalmanson 2013), consumers may perceive a feeling of contribution to the community as more positive than a feeling of liability to a company. Second, following prospect theory (Kahneman and Tversky 1979), consumers form expected (reference) prices beforehand and evaluate an offer more positively if the offered price is below this reference price (Thaler 1985). Applied to freemium, the reference price will be somewhere between the free and premium offer (positive WTP), while the free offer price (zero) will always be lower, making a positive evaluation likely. This explanation is consistent with the found positive WTP in management research (Lee et al. 2013; Wagner et al. 2014). Third, a price of zero bears the potential of a positive emotion since no sacrifice has to be made for the given quality. Put simply, a free offer causes emotions such as enjoyment because nothing has to be paid. Again, the consumer attributes the emotion to the object that caused it. As a result of these three mechanisms, the quality-price relationship is inversed. In this case, a free offer will likely have a greater perceived value. Subsequent research has confirmed the ZPE for the hotel business (Nicolau 2012; Nicolau and Sellers 2012), and bonus gifts (Chen et al. 2012; Palmeira and Srivastava 2013). However, no study has so far investigated the ZPE for the freemium business model. Since the underlying mechanisms of the ZPE agree with characteristics of the freemium concept and indicate concordance with freemium research findings, we continue with this approach as the foundation of our framework.

Theoretical framework

Our theoretical framework combines the two approaches described above: the fundamental drivers of value perception (e.g., Dodds et al. 1991) and the ZPE related to freemium (i.e., the "freemium effect"). If there is no ZPE, one would expect from the core definition of freemium (that the free version contains restrictions of features or content in order to gain profits with premium versions; Oestreicher-Singer and Zalmanson 2013), that quality is positively and sacrifice negatively framed by the chosen option (e.g., Monroe and Krishnan 1985). Hence, quality should be larger for the unrestricted, full-featured premium version than for the restricted, feature-reduced free version. By the same token, with the premium version having a price greater than zero and the free version having a price equal to zero, users would associate larger expenses and thus sacrifices for the premium version than for the free version. If there is a ZPE, one would expect a change in these two variables. However, previous research does not state whether quality or sacrifice or both are modified and how both shape the overall value perception. We argue that the underlying mechanisms of the ZPE strengthen the influence of the quality perception on value perception and dilute the influence of the sacrifice perception on value perception in the freemium context.

First, emerging social technologies and perspectives in online communication reinforce users' self-awareness as part of a community or as social actors (e.g., Gal et al. 2008; Lamb and Kling 2003; Oestreicher-Singer and Zalmanson 2013) and probably establish an online identity (Kim et al. 2012). In turn, this facilitates the activation of social norms as proposed by norm activation theory (Schwarz 1977) and social exchange norms in particular as a cause of the ZPE (Fiske 1992) which in turn improve valuation of the object (Shampanier et al. 2007). Hence, supposedly positive social exchange norms are strengthened. This can also be explained from an economics perspective. Fehr and Schmidt (1999) postulated in their inequality aversion theory that users are sensitive in favor or against their own gains. IS-related economic research supports this theory and supposes that sharing norms lead to a beneficial evaluation of voluntary payments and thus are a relevant driver of inequality aversion (e.g., Borck et al. 2006; Regner and Barria 2009). Both research streams clearly indicate that the evaluated objects are positively attributed. Consequently, quality will be higher for free than for premium offers.

Second, the price differential between versions likely influences the two other mechanisms (reference prices, affect). When it comes to the reference price, ZPEs have been investigated exclusively for products or services where the free version was not expected to be free (e.g., free bread sticks included with the main dish in a restaurant, Palmeira and Srivastava 2013). This is in line with confirmation-disconfirmation theory (Oliver and DeSarbo 1988) which assumes a positive evaluation of an object only if the offer exceeds the expectations, supporting our assumption that the ZPE will likely strengthen the influence of quality perception rather than the influence of sacrifice perception on value perception. Further, in the given context users likely expect certain features (e.g., minimum number of available songs, minimum storage), possibly pronounced by free sharing perceptions such as the free mentality (Lin et al. 2013). Accordingly, expected and unexpected features of the respective version will be attributed at the quality level. Again, economic theories support this assumption. As outlined by mental accounting theory (Thaler 1985), integration or separation of evaluations of quality and sacrifice influences their relevance. For free offers, a certain quality (large gain) is integrated with a low sacrifice (small losses, virtually no cost). In this case, the small sacrifice is likely neglected and the quality pronounced. Consequently, a stronger effect of quality perception should be expected. The affect mechanism further supports this assumption. Affect heuristics (e.g., Finucane et al. 2000) were found to frame attributes and hence quality perception. For example, enjoyment of getting music streaming for free clearly pictures the free version to be beneficial as long as these emotions are positive.

Finally, both perceptions of quality and sacrifice frame the trade-off of value (Kahneman and Tversky 1979; Zeithaml 1988). Consequently, a direct influence of the freemium effect on value perception can be assumed as well. Overall, we postulate that the freemium effect influences all three perceptions, with quality perception having a substantially larger influence on value perception. We thus hypothesize:

H1: A free offer will have a

a) higher perceived quality,
b) smaller perceived sacrifice,
c) more highly perceived value than a premium offer.

Notwithstanding criticism and inconsistent findings about the quality-price relationship (Rao and Monroe 1988; Voelckner and Hofmann 2007; Zeithaml 1988), the basic relationships between the three perceptive variables of quality, sacrifice (price), and value have been widely confirmed (Dodds et al. 1991). First, a perception of quality will increase the perception of value, under the assumption that the attributes are relevant for the consumer (e.g., Monroe and Krishnan 1985). Put simply, positively evaluated (objective and subjective) attributes of an offer will likely result in a positive evaluation that the offer contains considerably more benefits then expenses. We therefore expect:

H2: The relationship between perceived quality of the offer and perceived value of the offer is positive.

Second, and by the same token, a negative relationship between sacrifice (price) and value perception is expected. In line with traditional utility theory, price is a relevant cue for the amount of sacrifice needed to consume the offer (Dodds et al. 1991; Scitovszky 1945). Consequently, we assume:

H3: The relationship between perceived sacrifice of the offer and perceived value of the offer is negative.

Third and finally, value perception will be the basis for a decision process as postulated in traditional buyer behavior theory (e.g., Howard and Sheth 1969). If all other things are equal, an offer with considerably more benefits than expenses will motivate the consumer to acquire (buy) the product or service (Monroe and Krishnan 1985). The following hypothesis covers this relationship:

H4: The relationship between he perceived value of the offer and the intention to accept the offer is positive.

In addition, behavior theorists assume that intentions and behaviors are also influenced by attitudes (e.g., Ajzen 1991; Eagly and Chaiken 1993; Howard and Sheth 1969). That is, not only the utility of an offer increases intentions (and thereafter behaviors), but also the evaluation of the object. For example, a consumer joining LinkedIn as a freemium-based service does not make his/her decision just because the service is beneficial. He will also assess his or her disposition (is LinkedIn positive or negative for me?) on the basis of present perceptions, in this case value perceptions. Further, the evaluative nature of attitudes can be understood as a stable aspect of the decision-making process (e.g. Eagly and Chaiken 1993). Thus, an effect of value perceptions on attitudes towards the service indicates that the situational value perception is translated into a lasting evaluation of the service since an already existing attitude towards the service is less easy to overwrite. A positive attitude towards the service then strengthens the intention to accept the offer, while a negative attitude will weaken it. We as a result assume the following two hypotheses constituting a mediation effect of attitude:

H5: The relationship between the perceived value of the offer and the attitude towards the service is positive.

H6: The relationship between the attitude towards the service and the intention to accept the offer is positive.

We include several control variables to check the stability of the freemium effect and to control for possible external effects. Gender, age, and education are chosen to control for the background of the consumer. Involvement is used as an indicator of interest in and relevance of an online service. We also used frequency of usage (everyday, multiple times per week, multiple times per month, rarely, never) as a proxy of usage patterns. Finally, we included perceived quality inference as an individual attribute. Consumers who perceive a positive relationship between price and quality (high quality inference; Lichtenstein et al. 1993) could automatically associate a price variation with an extensive feature set. To control for this bias, we include this variable. The derived hypotheses lead to the following theoretical framework for freemium (Figure 1). In the next chapter, we report our two empirical studies we conducted to test the hypotheses.

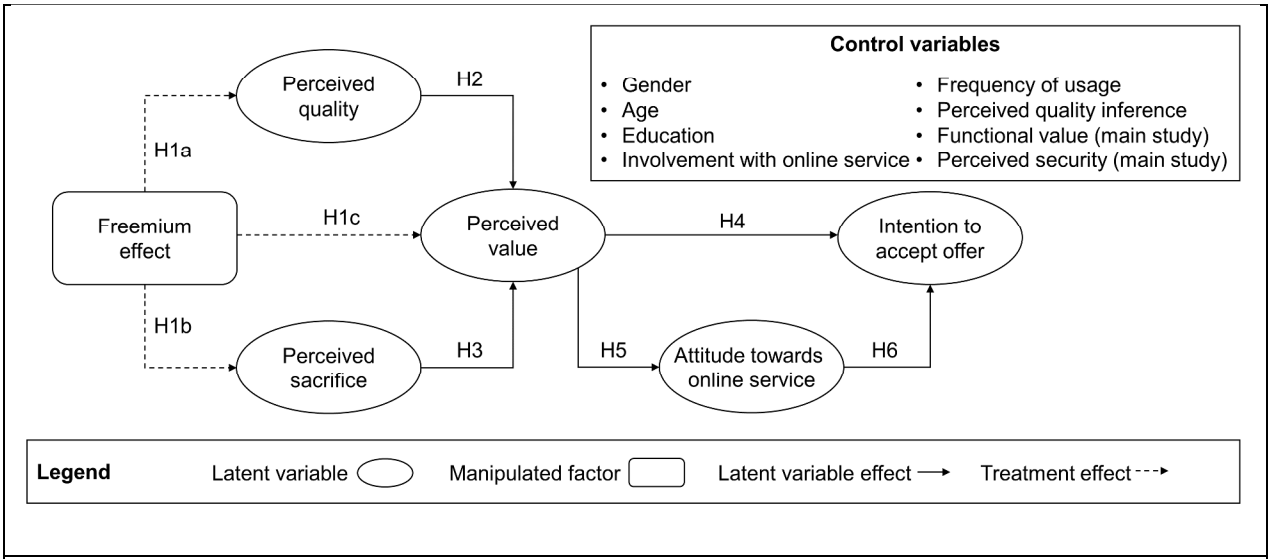

Figure 1. Theoretical framework

Overview of empirical studies

Goals

Our theoretical framework illustrates possible differences between free and premium versions in a freemium business model. In order to understand the consequences of the freemium effect, to control for other possible explanations, and to infer causal differences between the versions, we conduct a series of experiments (Sternthal et al. 1994).

Our first study, a three-group between-subjects online experiment, contributes to our research question by validating our theoretical framework and providing an initial investigation of the measures relevant for our framework. Balancing internal and external validity, we manipulate existing pricing options of the music-streaming platform Spotify (as of September 2013). This study shows that our framework is valid and that the free offer indeed is perceived as more valuable than the two premium versions (called "basic" and "premium"). There are however limitations in our first design, the most important of which was not dissembling the treatment into price and feature set. In order to overcome these limitations, the main study that was subsequently carried out (a 4x4 between-subjects online experiment) with an extensive manipulation of price and feature set (storage), using the cloud-based storage service Dropbox. The main study provides support for the assumed effects of freemium on quality and sacrifice perception. In line with the initial study, free versions generated more value for participants. Finally, investigating WTP, the main study confirms previous findings (Lee et al. 2013; Schreiner and Hess 2013). Hence, even free versions have a positive WTP. These results are in concordance with the last pricing adjustment of Dropbox (08/27/2014), indicating external validity as well.

Measures and samples

To improve the comparability of the two studies, Tables 1 and 2 integrate the measures and samples used in both of them. Argumentation for measure modification is provided in the method description of study 2. All analyses in the two studies were conducted via *R 3.1.3* (packages *lavaan*, *psych*, *car*, and *mediation*).

Measure
Attitude towards online service[1,2] (modified to fit with utilitarian use of Dropbox): (1) 1. Very negative, very positive; 2. Unfavorable, favorable (2) 1. Very negative, very positive; 2. Not at all useful, very useful
Intention to accept offer[3,4] (modified to fit with hypothetical offers in the main study): (1) 1. Highly unlikely, highly likely; 2. Highly improbable, highly probable; 3. Definitely not buy, definitely buy (2) 1. Highly unlikely, highly likely; 2. Highly improbable, highly probable; 3. No chance at all, very good chance
Involvement with online service[5,6] (modified to fit with more passive use of Dropbox): (1) 1. I am very interested in Spotify; 2. My level of involvement with Spotify is high (2) 1. I am particularly interested in Dropbox; 2. Given my personal interests, Dropbox is not very relevant to me (R)
Perceived quality[7,8] (uni-dimensionality warranted for latter): (1) 1. Spotify provides wide ranges of music; 2. Spotify provides most of the service functions that I need; 3. Spotify performs the service correctly the first time; 4. My online transactions are always accurate (2) 1. Dropbox is reliable in its performance; Dropbox has an acceptable standard of quality; Dropbox is good in terms of its overall excellence; Dropbox possesses a degree of quality which is satisfactory
Perceived sacrifice[9,10] (modified to fit with hypothetical offers in the main study and importance of non-financial sacrifices of Dropbox): (1) 1. The price charge to use Spotify is very high; 2. The time required to use Spotify is very high; 3. The effort that I must make to receive the services offered is very high (2) 1. If I purchased the offer for the indicated price, I would not be able to purchase some other products I would like to purchase now; 2. If I purchased the offer for the indicated price, I would not be able to purchase some other products I would like to purchase now
Perceived value[11,12] (modified to fit with hypothetical offers in the main study): (1) 1. The product is reasonably priced; 2. The product offers value for the money; 3. The offer is a good product for the price (2) 1. The offer is an excellent value for the money; 2. Overall, the offer is a poor value for the money (R); 3. The offer looks like a good buy
Perceived quality inference[13]: (1 and 2) 1. Generally speaking, the higher the price of a product, the higher the quality; 2. The old saying "you get what you pay for" is generally true; 3. The price of a product is a good indicator of its quality; 4. You always have to pay a bit more for the best
Functional value[14]: (main study only) 1. It is likely that the features will offer advantages to the consumer; 2. How likely is it that the features will add value to the advertised product?; 3. The features are likely to perform well
Perceived security[15]: (main study only) 1. I feel like my privacy is protected at Dropbox; 2. I feel safe in my transactions with Dropbox; 3. Dropbox has adequate security features
Notes. Measured with 7-point Semantic Differential; LT: Measured with 7-point Likert-type scale of agreement (strongly disagree, disagree, somewhat disagree, neither agree or disagree, somewhat agree, agree, strongly agree); all scales were recoded to the same range (1 to 7) and direction; R: Reversed item; Adaptions of scales from 1: Stafford (1996, SD); 2: Ziamou and Ratneshwar (2003, SD); 3: Taylor and Baker (1994, SD); 4: Chandran and Morwitz (2005, SD); 5: Keaveney and Parthasarathy (2001, LT); 6: Coulter et al. (2003, LT); 7: product portfolio and reliability dimensions of Yang et al. (2004, LT); 8: Kim et al. (2011, LT); 9: Cronin et al. (2000, LT); 10: Teas and Agarwal (2000, LT); 11: Sweeney and Soutar (2001, LT); 12: Hardesty and Bearden (2003, LT); 13: Lichtenstein et al. (1993, LT); 14: Cox and Cox (2002, LT); 15: Wolfinbarger and Gilly (2003, LT)

Table 1. Measures of latent variables in initial (1) and main (2) study

Sample characteristic		Initial study (1)	Main study (2)
Overall respondents		158	1,991
Gender	Female	86 (54.4%)	878 (44.1%)
	Male	72 (45.6%)	1,113 (55.9%)
Age	Mean	28.76 years	23.28 years
	0-19	14 (8.9%)	316 (15.9%)
	20-29	106 (67.1%)	1,385 (69.6%)
	30-39	16 (10.1%)	241 (12.1%)
	40-49	7 (4.4%)	33 (1.7%)
	50+	15 (9.5%)	16 (.8%)
Education	No degree	0 (.0%)	2 (.1%)
	Secondary degree	0 (.0%)	4 (.2%)
	Junior high degree	21 (13.3%)	22 (1.1%)
	School diploma	64 (40.5%)	1,106 (55.5%)
	University degree	73 (46.2%)	857 (43.0%)
Employment	Trainee	13 (8.3%)	12 (.6%)
	Student	79 (50.0%)	1,504 (75.5%)
	Employee	54 (34.2%)	460 (23.2%)
	Self-employed	4 (2.5%)	12 (.6%)
	Unemployed	8 (5.1%)	3 (.2%)

Table 2. Sample characteristics for initial and main study

Initial study

Method

The main goals of the initial study are to test whether our theoretical framework is valid and whether our measurements allow an investigation of freemium effect consequences. In order to investigate a realistic effect (external validity), we chose actual offers of the prominent freemium service Spotify as a first setting. Spotify is one of the most successful music-streaming services providing free, basic and premium options. Following a pre-test of 30 respondents, the three offers were set to free (price €0, ad-funded, database of 20 million songs, limited to the desktop version), basic (price €4.99 monthly, ad-free, 20 million songs, limited to the desktop version), and premium (price €9.99 monthly, ad-free, 20 million songs, available for all devices) versions with prices and features being dependent, reflecting real offers. This is why we used a statistical design rather than a true experimental design with a control group and pre-post-test measurement.

Participants of the main study were recruited using an e-mail invitation (including a survey link) in social networks and student mailing lists at a large university in Germany. After the participants opened the link, they were randomly redirected to one of three experimental conditions (free, basic, premium) and introduced to the features of Spotify, highlighting the respective price and feature attributes. This randomization reduced biasing factors (e.g., self-selection). We then asked some introductory questions (knowledge and intensity of using various online services) before the relevant variables were measured. Respondents then provided social demographic and online usage behavior. As an incentive, all participants had the opportunity to participate in a lottery of three €15 bookseller coupons (unrelated to Spotify) by sending an e-mail address in a distinct form at the end of the experiment. As mentioned to the participants, the addresses provided cannot be traced back to the answers given in the experiment. Overall, 158 respondents completed the survey. Mean age (28.76 years), gender (54.4% female), and employment (50.0% students) distribution indicated a relatively representative sample for Internet research.

Results

First, reliability and validity of the respective latent variables is checked. Table 3 (initial study, left side) shows the descriptive statistics, loadings, and reliability estimates of the sample derived by exploratory and confirmatory factor analyses (EFA, CFA). The EFA identifies two highly correlated (r = .69) factors of perceived quality. However, since Cronbach's Alpha and CFA confirm that a one-factor solution is reasonable, we continue with perceived quality as one latent variable. All other latent variables fulfill the standard requirements (Gerbing and Anderson 1988). Further, discriminant validity was tested by the criterion of Fornell and Larcker (1981) in CFA. All items load highly on their assumed latent variables and less on other latent variables, indicated by all AVEs being larger than the maximum correlation with another latent variable (largest correlation = .49 between PVAL and INT, AVE for PVAL = .77, AVE for INT = .80). Discriminant validity is thus satisfied as well. Overall, the CFA implied model fits the data well (χ^2 = 172.75 (d.f. = 131), CFI = .97, SRMR = .05) which supports the validity of our framework.

		Initial study					*Main study*				
Latent variable	**Item**	**FL**	**M**	**SD**	**α**	**AVE**	**FL**	**M**	**SD**	**α**	**AVE**
Attitude towards online service (ATT)	att1	.75	6.63	1.38	.78	.65	.85	5.14	1.38	.81	.68
	att2	.86	6.43	1.44			.80	5.37	1.56		
Intention to accept offer (INT)	int1	.94	4.30	1.95	.93	.80	.95	2.42	1.91	.95	.87
	int2	.95	4.61	1.77			.89	2.83	1.94		
	int3	.78	3.91	1.59			.96	2.66	1.88		
Involvement with online service (INV)	inv1	.86	3.85	.98	.84	.69	.68	3.51	1.33	.74	.60
	inv2	.81	4.79	1.15			.86	3.90	1.41		
Perceived quality (PQUAL)	pqual1	.62	5.70	1.31	.77	.46*	.72	5.15	1.11	.88	.66
	pqual2	.67	3.92	1.21			.86	4.87	1.22		
	pqual3	.74	4.99	1.44			.81	4.76	1.35		
	pqual4	.69	5.15	1.36			.85	4.86	1.27		
Perceived sacrifice (PSAC)	psac1	.72	3.33	1.11	.86	.82	.89	3.70	1.94	.90	.83
	psac2	1.00	4.31	1.21			.93	3.95	1.93		
Perceived value (PVAL)	pval1	.82	4.89	1.44	.92	.77	.92	3.53	1.70	.92	.79
	pval2	.99	4.85	1.36			.84	4.06	1.75		
	pval3	.82	4.97	1.36			.90	3.61	1.65		
Price quality inference (PQI)	pqi1	.62	3.91	.95	.78	.56	.80	3.79	1.44	.80	.51
	pqi2	.85	4.15	.96			.65	4.06	1.43		
	pqi3	.76	4.11	.81			.78	3.83	1.34		
	pqi4**	-	-	-			.62	4.37	1.46		
Functional value (FVAL) ***	fval1	-	-	-	-	-	.83	4.77	1.68	.91	.78
	fval2	-	-	-			.92	4.73	1.58		
	fval3	-	-	-			.91	4.82	1.67		
Perceived security (PSEC) ***	psec1	-	-	-	-	-	.91	3.58	1.58	.88	.85
	psec2	-	-	-			.87	3.31	1.59		
	psec3	-	-	-			.78	3.68	1.30		

Notes. FL: Standardized factor loading: Loading of item with latent variable (CFA, all variances set to 1), M: Mean; SD: Standard deviation; α: Cronbach's Alpha; AVE: Average variance extracted (CFA); *loads on 2 factors; **Item deleted due to low factor loadings; ***Main study only

Table 3. Item descriptives and reliability of the latent variables used in both studies

Second, we continue with an investigation of the freemium effect in three steps. For the first one, a MANOVA is conducted to test the overall freemium effect on all dependent variables together (quality, sacrifice, value, attitude, intention). Pilllai's test statistic is used for multivariate F-tests. To investigate which dependent variable is influenced by the freemium effect, a follow-up ANOVA estimates the effects for each dependent variable in a second step. The third and last step applies post-hoc comparisons (Tukey's honest squared distance test) to identify which groups of nonmetric variables (freemium, gender, education) contribute to the significance of possible differences between free, basic, and premium

options. In the case of metric variables, the linear estimate is provided to explore the direction of the effect. All models take into account the aforementioned control variables (gender, age, education, involvement with Spotify, perceived quality inference). Standardized factor scores are used for all latent variables, and all standard requirements of ANOVAs were fulfilled (equal covariances in groups, normality of residuals, no multicollinearity).

The MANOVA confirms a significant effect of the offer on all dependent variables ($F(10, 230) = 3.40$, $p = .00$). Among control variables, only gender ($F(5, 114) = 7.64$, $p = .03$) and involvement ($F(5, 114) = 2.55$, $p = .03$) influence the variables as well. In other words, manipulation changed the decision process overall, contributing to the validity of our framework. Perceived quality is significantly different between free and premium options ($F(2, 149) = 7.10$, $p = .00$, $\eta^2 = .09$). No control variable effects are found. Remarkably, post-hoc comparisons reveal that only free ($M = -.31$, $n = 55$) and premium offers ($M = .33$, $n = 48$; basic: $M = .07$, $n = 55$) are different and that the direction was opposite to H1a (difference = .63, $p = .00$; H1a rejected). Consequently, respondents viewed premium offers as more beneficial than free offers. The freemium effect on perceived sacrifice cannot be found ($F(2, 149) = 2.53$, $p = .08$, $\eta^2 = .04$; rejecting H1b).

Despite the failure to accept H1a and H1b, a freemium effect for perceived value is present ($F(2, 147) = 3.54$, $p = .03$, $\eta^2 = .06$; H1c confirmed). Respondents value free offers ($M = .26$, $n = 55$) more than premium ($M = -.20$, $n = 48$; difference to free: .46, $p = .03$), but equally to basic offers ($M = -.09$, $n = 55$; difference to free: .35, $p = .12$). Further, quality ($F(1, 147) = 6.40$, $p = .01$, $\eta^2 = .03$; confirming H2) and sacrifice ($F(1, 147) = 9.63$, $p = .00$, $\eta^2 = .04$; confirming H3) perception both positively contribute to value perception. For the decision variables, the intention to accept the offer is influenced by the freemium effect ($F(2, 116) = 7.41$, $p = .00$, $\eta^2 = .08$) and perceived value ($F(1, 116) = 33.55$, $p = .00$ $\eta^2 = .18$; confirming H4). Perceived value is, as expected, positive ($b = .42$). Post-hoc comparisons show that both free ($M = .43$, $n = 55$) and basic ($M = -.16$, $n = 55$; difference to free: .59, $p = .00$) as well as free and premium ($M = -.05$, $n = 48$, difference to free: .48, $p = .01$) are significantly different. Finally, and despite this, attitudes toward Spotify have no effect on the intention to accept the offer ($F(1, 116) = 1.25$, $p = .27$, $\eta^2 = .01$; rejecting H6), so effects influencing attitude exist. The assumed positive relationship between value perception and attitude is insignificant ($F(1, 115) = 3.17$, $p = .08$, $\eta^2 = .02$; rejecting H5), while perceived quality ($F(1, 115) = 7.67$, $p = .01$, $\eta^2 = .05$) positively improves the attitude towards Spotify. In other words, benefits of Spotify contribute directly to a positive evaluation of Spotify.

Discussion

Our initial study partially confirms the freemium effect. Differences in the service offered shape subsequent variables of perception (quality, sacrifice, and value) as well as attitude and intention (MANOVA). However, quality perception is higher for premium than for free offers. Likewise, perceived sacrifice is not affected by freemium. Both results can be explained by a limitation of the realistic design approach applied in this study. Since price and features are not manipulated independently, the isolated (main) effects of both aspects cannot be dissembled. Consequently, our main study aims to eliminate this weakness by the separate manipulation of price and feature set. Further, our results confirm that the appropriateness of most measurement variables (except perceived quality) mainly support the relationships of the theoretical framework. Value perception is higher for free rather than for premium offers and in turn influences intentions to accept the offer. Finally, this effect seems to be strong enough that the freemium effect directly shapes intentions, supporting the importance of ZPEs in the freemium context. Attitudes instead do not frame intentions, negating a mediator role between value perception and acceptance intentions. In total, and despite the flaws, we see a substantial contribution from analyzing the freemium effect in the decision process of users and thus continue with our main study.

Main study

Method

The primary goal of our main study is to analyze the freemium effect within our framework, albeit without the limitations of the initial study. We consequently revised the design and used a 4x4 between-subjects online experiment that detangles price and features. We selected another well-known freemium service, Dropbox, a pioneer and successful cloud-based online storage service, as the setting. In line with the realistic approach of the initial study, we use the options offered by Dropbox before the price and feature

model update on 08/27/2014, containing four price (€0, €9.99, €19.99, €49.99) and four storage levels (2 GB, 100 GB, 200 GB, 500 GB). These price and storage levels are systematically varied in the main study.

In addition to the design revision, four minor improvements are introduced. First, we replaced the two-dimensional latent variable of perceived quality with a uni-dimensional alternative (Kim et al. 2011). Second, we modified the measurement of latent variables because Dropbox is supposedly viewed as a more utilitarian service than Spotify (changes to attitude towards the online service) and as less actively used than Spotify because Dropbox synchronizes files automatically (changes to involvement). Further, our design possibly might lead to unknown, hypothetical combinations (e.g., 500 GB for €0). Consequently, items were selected that better account for this issue (changes in intentions, perceived sacrifice, and perceived value).

Third, to control for possible effects that cannot be traced back to content or theory, but instead to the fact that all variables are measured within one questionnaire (potential common method bias; Podsakoff et al. 2003), we introduce a bogus question ("Please click: 'I do not agree'.") and an unrelated marker variable (environmental consciousness, "In my opinion, stores sell too many environmentally harmful products"). All respondents that indicate a lack of motivation by not answering the bogus question correctly are removed. Further, the largest correlation between a variable under consideration and the marker variable is .07 ($t(1,989) = 3.27$, $p = .00$ with perceived sacrifice). Both results indicate that a common method bias is not very likely. Fourth, we add two new variables measuring the perceived functional value with an offer provided (Cox and Cox 2002) and the perceived security (Wolfinbarger and Gilly 2003) as control variables to account for individual perceptions of the usefulness of the feature set and the expected level of security and privacy. The latter one is selected as a consequence of the Dropbox setting since cloud-based online storage is often used for private or confidential data. Fifth and finally, we integrate four questions to measure WTP via price preferences (van Westendorp 1976), a variable that has been repeatedly investigated in IS and management research. The measure consists of four questions reflecting the preferred price range between too expensive and too cheap ("At what price is it so expensive that it would not be considered at all?"; "At what price would it start to get expensive, but still worth considering?"; "At what price would you consider this product to be a great value for the money"; "At what price would it be so cheap that quality is doubted and it is not worth considering?").

A pretest with 22 participants was conducted to test whether all levels are regarded as realistic. After the pretest, participants for the main study were recruited equally to the initial study (e-mail invitation including a survey link, social networks and student mailing lists at a larger university in Germany). By clicking the link, participants were randomly redirected to one of the 16 experimental conditions (four price levels x four storage levels), viewed the highlighted price and features of Dropbox, and answered introductory questions (knowledge and usage intensity of Dropbox) before the relevant variables were measured. This random assignment reduced the probability of biasing factors. However, due to the complexity of our factorial design, control groups or pre-post-test measurement were omitted. Finally, respondents answered social demographic questions. A lottery of three coupons for Amazon (€50, unrelated to Dropbox) was used as an incentive for participation. Participants were invited to the lottery after questionnaire completion as in the previous study. In order to gain comparable results, the sampling procedure was identical to the initial study. Overall, 1,991 respondents completed the experiment. Mean age (23.28 years), gender (44.1% female) and employment (75.5% students) distribution indicate a younger and more student-oriented sample in comparison to the study before, which can be regarded as a valid sample with younger people being a vital target group for services such as Dropbox.

Results

Next, reliability and validity of the latent variables measured in the main study are checked. Table 3 (Main study, right hand) indicates loadings, descriptive statistics, and reliability estimates (Cronbach's Alpha; Average variance extracted, AVE) derived from both types of factor analyses (EFA, CFA). As intended by revising the perceived quality measure, the items of this variable load on one factor while reliability improves. All latent variables achieve the required minima for reliability (Gerbing and Anderson 1988) and are confirmed as statistically discriminant (largest correlation = .78 between PVAL and INT, AVE for PVAL = .79; AVE for INT = .87). Again, it should be noted that the model fits the data well (CFA: χ^2 = 1,083.55 (d.f. = 263), CFI = .98, SRMR = .03).

Since reliability and validity is established, we continue with the three step procedure as in the initial study. In a first step, a MANOVA checks whether price and storage influence all dependent variables together (perceived quality, perceived sacrifice, perceived value, attitude towards Dropbox, intention to accept the offer). Second, follow-up ANOVAs isolate the effects for each dependent variable (Table 4). Third, post-hoc tests (Tukey's honest squared distance) identify differences between groups pair-wise. Again, control variables are employed to test background effects, standardized factor scores are used for all latent variables, and traditional requirements for analyses of variance are checked (equal covariances in groups, normality of residuals, and no multicollinearity).

The MANOVA confirms a significant effect of price ($F(15; 5{,}877) = 81.97$, $p = .00$) and storage ($F(15; 5{,}877) = 5.05$, $p = .00$) on all dependent variables. No interaction effect between price and storage is present ($F(45; 9{,}805) = .94$, $p = .59$). Due to the large sample, almost all control variables are significant (gender: $F(5; 1{,}957) = 17.60$, $p = .00$; age: $F(5; 1{,}957) = 1.87$, $p = .10$; education: $F(20; 7{,}840) = 4.99$, $p = .00$; involvement: $F(5; 1{,}957) = 14.17$, $p = .00$; frequency of usage: $F(20; 7{,}840) = 49.64$, $p = .00$; price quality inference: $F(5; 1{,}957) = 4.03$, $p = .00$; functional value: $F(5; 1{,}957) = 45.88$, $p = .00$; perceived security: $F(5; 1{,}957) = 119.16$, $p = .00$). That is, price alone, not storage, frames the evaluation process confirming the freemium effect. Taking into account the large sample size, we now report only larger than marginal effects for control variables ($\eta^2 > .01$; Cohen 1992).

Follow-up ANOVAs reveal that perceived quality is significantly different between free and priced options ($F(3; 1{,}961) = 24.22$, $p = .00$, $\eta^2 = .02$) with neither a storage effect ($F(3; 1{,}961) = .91$, $p = .43$, $\eta^2 = .00$) nor an interaction of price and storage ($F(9; 1{,}961) = 81$, $p = .61$, $\eta^2 = .00$). Post-hoc comparisons show that all combinations of free priced offers are statistically different (€0: M = .23, n = 508; €9.99: M = .03, n = 484; €19.99: M = -.16, n = 497; €49.99: M = -.10, n = 502; smallest difference [€9.99 to €49.99] = .19, p = .04). Consequently, free offers are perceived as being more beneficial then priced offers (H1a confirmed). Control variables contribute to the effect as well. Participants who perceive higher quality are more involved ($F(1; 1{,}961) = 104.49$, $p = .00$, $\eta^2 = .04$), more sensitive to the quality-price relationship ($F(1; 1{,}961) = 40.47$, $p = .00$, $\eta^2 = .01$), link the offer to more value ($F(1; 1{,}961) = 240.59$, $p = .00$, $\eta^2 = .08$), perceive Dropbox as more secure ($F(1; 1{,}961) = 323.92$, $p = 0.00$, $\eta^2 = .11$), and use Dropbox more frequently ($F(4; 1{,}961) = 31.44$, $p = .00$, $\eta^2 = .04$, everyday: M = .45, n = 321; never: M = -.80, n = 225).

In terms of perceived sacrifice, price ($F(3; 1{,}961) = 161.78$, $p = .00$, $\eta^2 = .19$) influences perceptions as expected (€0 : M = -.60, n = 508; €9.99: M = -.10, n = 484; €19.99: M = .21, n = 497; €49.99: M = .50, n = 502; smallest difference [€19.99 to €49.99] = .29, p = .00) while neither storage ($F(3; 1{,}961) = .22$, $p = .88$, $\eta^2 = .00$) nor the interaction effect of both ($F(9; 1{,}961) = .96$, $p = .48$, $\eta^2 = .00$) are present (H1b is confirmed). Only gender ($F(1; 1{,}961) = 38.83$, $p = .00$, $\eta^2 = .02$) and education ($F(1; 1{,}961) = 7.50$, $p = .00$, $\eta^2 = .01$) contributed as control variables with a reasonable effect: men (M = -.10, n = 1, 113) perceive less sacrifice than women (M = .13, n = 878; difference = .24, p = .00) and participants with a university degree (M = -.11, n = 857) perceive less sacrifice than those with a school diploma (M = .01, n = 1,106).

Price affected value perception ($F(3; 1{,}959) = 472.16$, $p = .00$, $\eta^2 = .34$) in line with expectations (€0: M = .93, n = 508; €9.99: M = -.11, n = 484; €19.99: M = .33, n = 497; €49.99: M = -.51, n = 502; smallest difference [€19.99 to €49.99] = .18; p = .00). In contrast to the perceptions of quality and sacrifice, storage frames the value perception as well ($F(3; 1{,}959) = 24.51$, $p = .00$, $\eta^2 = .02$) but not the interaction of both ($F(9; 1{,}959) = 1.71$, $p = .08$, $\eta^2 = .00$). Since the magnitude of the price effect is substantially larger ($\eta^2 = .34$) than the storage effect ($\eta^2 = .02$), empirical support for the ZPE and hypothesis H1c is strong. Further, and in line with our framework, quality ($F(1; 1{,}959) = 462.21$, $p = .00$, $\eta^2 = .11$; confirming H2) and sacrifice perception ($F(1; 1{,}959) = 40.17$, $p = .00$, $\eta^2 = .01$; confirming H3) both contribute to the evaluation of value. As assumed in the theoretical framework, quality perception had a stronger influence on value perception than sacrifice perception despite sacrifice being shaped more intensively by price than quality. Among control variables, only gender ($F(1; 1{,}959) = 67.35$, $p = .00$, $\eta^2 = .02$; female: M = .11, n = 878; male: M = -.09, n = 1,113) slightly explains variations in value perception.

As expected, intentions to accept the offer are influenced by the freemium effect. Accepting an offer is significantly more likely when a free version is shown ($F(3; 1{,}959) = 706.95$, $p = .00$, $\eta^2 = .39$). Post-hoc tests reveals that most differences are significant (€0: M = 1.04, n = 508; €9.99: M = -.24, n = 484; €19.99: M = -.33, n = 497; €49.99: M = -.50, n = 502). Remarkably, only the difference between the €9.99 and the €19.99 offer is not significant (difference = .09, p = .11). Storage effect ($F(3; 1{,}959) = 1.55$, $p = .20$, $\eta^2 = .00$) and interaction effect again remain insignificant ($F(9; 1{,}959) = .37$, $p = .95$, $\eta^2 = .00$), further

supporting the freemium effect. Moreover, since both value perception ($F(1; 1{,}959) = 1{,}107.00$, $p = .00$, $\eta^2 = .21$) and attitude towards Dropbox ($F(1; 1{,}959) = 80{,}10$, $p = .00$, $\eta^2 = .01$) frame intentions positively, H4 and H5 are confirmed. Causal mediation analysis (Zhao et al. 2010) nevertheless reveals that the mediation effect (b = .02, confidence interval: [.01, .03]; 5.000 bootstrapped samples) is very small. Only 2.7% of the effect of perceived value on intentions is mediated via the attitude towards Dropbox. No control variables contribute to the variance of intentions.

Finally, along with a positive effect of attitudes towards Dropbox on the intention to accept the offer, value perception ($F(1; 1{,}960) = 343.11$, $p = .00$, $\eta^2 = .07$, confirming H6) significantly predicts attitude. In an exploratory manner, four control variables possess a substantial effect on the attitude toward Dropbox: a positive involvement ($F(1; 1{,}960) = 327.72$, $p = .00$, $\eta^2 = .06$), a higher frequency of usage ($F(4; 1{,}960) = 352.94$, $p = .00$, $\eta^2 = .27$; everyday: M = .64, n = 321; never: -1.41, n = 225, all post-hoc differences significant), a higher functional value ($F(1; 1{,}960) = 164.74$, $p = .00$, $\eta^2 = .03$), and a higher perceived security ($F(1; 1{,}960) = 871.17$, $p = .00$, $\eta^2 = .17$).

Variable	**Perceived quality**	**Perceived sacrifice**	**Perceived value**	**Intention**	**Attitude**
Treatment variables					
Price	negative	positive	negative	negative	-
Storage	irrelevant	irrelevant	positive	irrelevant	-
Price * storage	irrelevant	irrelevant	irrelevant	irrelevant	-
Framework variables					
Perceived quality	-	-	positive	-	-
Perceived sacrifice	-	-	negative	-	-
Perceived value	-	-	-	positive	positive
Attitude	-	-	-	positive	-
Control variables					
Gender	irrelevant	f > m	f > m	irrelevant	irrelevant
Age	irrelevant	irrelevant	irrelevant	irrelevant	irrelevant
Education	irrelevant	negative	irrelevant	irrelevant	irrelevant
Involvement	positive	irrelevant	irrelevant	irrelevant	positive
Frequency of usage	positive	irrelevant	irrelevant	irrelevant	positive
Perceived quality inference	positive	irrelevant	irrelevant	irrelevant	irrelevant
Functional value	positive	irrelevant	irrelevant	irrelevant	positive
Perceived security	positive	irrelevant	irrelevant	irrelevant	positive

Notes. Analysis of variance (ANOVA); positive = positive effect; negative = negative effect; irrelevant = / not relevant effect (control variables only); - = not estimated; f = female; m = male

Table 4. Overview of effects for the dependent variables

Willingness to pay

As an exploratory addition to the hypothesis-driven main study, we applied van Westendorp's (1976) price sensitivity method. This method allows us to check whether our results are comparable to previous investigations of WTP (Lee et al. 2013; Schreiner and Hess 2013). In other words, we aim to check whether free versions have a positive financial value which can be understood either as the price regarded justified to overcome the opportunity cost of the free version (e.g., limited storage), or as an alternative to intentions (Voelckner and Hoffmann 2007). In a first step, we applied a MANOVA for the four questions of WTP (too expensive, expensive, great value, too cheap) for the latter approach. By doing so, an overall effect can be understood as change in WTP as an intention. Only plausibility-checked replies are used (all four prices had to be descending from too expensive to too cheap). MANOVA results replicate the findings of intentions. Both price ($F(12; 4{,}584) = 20.56$, $p = .00$) and value perception ($F(4; 1{,}526) = 29.43$, $p = .00$) have a strong effect on WTP. Moreover, only storage ($F(12; 4{,}584) = 4.73$, $p = .00$), attitude towards Dropbox ($F(4; 1{,}526) = 4.23$; $p = .00$) and education ($F(16; 6{,}116) = 2.17$, $p = .01$) marginally contribute to the explained variance of price willingness. In a second step, we calculated the four price sensitivity points suggested by van Westendorp (1976). The so-called "point of marginal cheapness" (PMC) and "point of

marginal expensiveness" (PME) define a range in which prices are competitive, i.e. not considered too cheap or too expensive by a relevant number of respondents. Within this range, two points indicate an optimal price; the indifference price, where bargain and expensive evaluations are equal and the optimal price, where too cheap and too expensive evaluations are equal. In line with previous findings, even free offers generate a WTP that is larger than zero, ranging from a PMC of €2.06 (2GB) to a PME of €7.04 (2GB). The findings depicted in Table 5 support the assumed mechanisms of the ZPE. Getting an offer for free that has a positive WTP can be seen as a bargain and thus improves affective and cognitive evaluation mechanisms of a free offer. Our findings remarkably confirm the recent adjustment in Dropbox' price policy, enhancing the external validity of the main study: the prices most people find acceptable (optimal price) never exceed €10 (maximum: €10.36 for the 200GB-€49.99 offer), the current premium Dropbox offer (€9.99 as of 04/01/2015).

Storage	Price	n	Optimal price	Indifference price	Lower border (PMC)	Upper border (PME)
Overall		1557	€7.28	€9.36	€4.86	€11.69
2 GB	€0	74	€2.50	€4.24	€2.06	€7.04
100 GB	€9.99	97	€6.57	€8.76	€4.53	€9.50
200 GB	€19.99	104	€7.69	€9.74	€6.33	€16.00
500 GB	€49.99	111	€10.36	€16.19	€7.00	€18.14
Notes. n = Sample size; PMC = Point of marginal cheapness; PME = Point of marginal expensiveness						

Table 5. Price points for willingness to pay

Discussion

Our main study confirms the postulated freemium effect and theoretical framework. Overall, within an acceptable price range (according to optimal price points up to €10), price perceptions dominate value perception directly as well as indirectly (via value) and frame evaluations of the offer (intentions, WTP). In line with our framework, the consequences for this freemium effect are confirmed: On the one hand, a free offer improves perceived quality as the perception of benefits of the service. On the other hand, participants perceive free offers as having no sacrifice. Further, storage as the feature restricted in free offers exerts a far less significant effect and only contributes to the perception of value. We carefully crafted the experiment in the main study to exclude alternative explanations and to improve external validity. First, a common method bias does not seem to be present. Second, our findings support the lasting importance of the freemium effect despite integrating multiple control variables that individually contribute to explain freemium decision-making. The finding that our treatment has a lasting effect on the decision variables while control variables have an inconsistent effect pattern supports the notion that the freemium effect is fundamental in consumer's decision behavior. Most importantly, we find support for our assumption that quality perceptions are more influential than sacrifice perceptions despite stronger differences in sacrifice. Thus, users evaluate a free version more positively because of the surprisingly comparable quality for a much smaller sacrifice. Third, findings in connection with WTP (Table 5) are in line with previous findings that even a free version possesses a positive price acceptance; these are in concordance with Dropbox's practical business strategy.

General discussion

Implications for practice

Both studies contributed to our research question. Our initial study demonstrated validity for the nomological framework and showed improvements for manipulation as well as measurement. The main study implemented these improvements and found substantial support for the freemium effect. Here, implications for practice are apparent. Contrary to the traditional doctrine of incremental value with more features, free offers inversely shape the consumers' value perception, providing more value than premium services, not less. Since the freemium decision-making process is guided by the relationship between quality, sacrifice and value, these three variables offer themselves as appropriate, primary starting points for service companies using or considering freemium business models. Free offers should be clearly

marked as "free", "no payment needed", or "zero price" to trigger the ZPE of higher perceived quality and lower sacrifice. However, in order to ease a transition from free to premium services, price should not be the argument because it implies lower quality for substantially higher sacrifices. The only viable option here seems to be the improvement of the feature-related benefits. Practitioners are well advised to improve the transparency and explanatory power of their features, which is in fact already being intuitively done by some companies. For example, Dropbox uses a clean, benefit-focused webpage for its premium offers, while pricing options are shifted to an extra webpage.

Recommendations for strategic options investigated in management research can also be derived. Free offers can be used as entry options to attract more users (upselling). Here, a strategic perspective on the differentiation of price and feature set is vital. Our initial study demonstrates that even in a carefully crafted, balanced portfolio of sacrifices and benefits, the free version was linked with more value and thus is more likely to be accepted. From a seller's perspective, freemium strategies are free and offer-dependent. Consequently, sellers can apply three basic strategies to overcome this dependency: 1) adapt the free version to be profitable via ads and referrals, 2) generate strong upselling potential via the feature set, or 3) cancel the freemium business model. Remarkably, our results indicate that perceived security only has an effect on the attitudes towards a freemium service. With respect to the first option, even in light of today's hacker attacks, password leaks, and related issues, consumers do not make their ultimate decisions on the basis of security and privacy concerns. This result can however be context-specific to Dropbox, which fulfills a security standard that is obviously sufficient for our participants. Future trends and other applications of freemium thus raise possible questions that have not yet been researched, e.g. whether security/privacy is a "must" or even a motivator in some cases. Further, using free versions with a significant amount of ads or to test functions ("beta test") can have serious consequences since price is not the only indicator of quality. So opportunity costs such as time expenses and quality issues may reduce the benefits linked, eventually wiping out the free versions' positive evaluation of value. Finally, and in line with the upselling option, sellers can use the WTP as a guideline for strategic price settings. For example, if prices for the premium version are set slightly below the WTP of ad-annoyed or storage-frustrated users (e.g., indifference price), the share of premium users can be expanded. Notwithstanding these options, sellers also have to account for the given level of competition and their actions.

Research limitations and outlook

From a theoretical perspective, our article contributes to previous IS and management research by demonstrating that a traditional positive relationship between quality and price cannot be assumed for the freemium business model. Notwithstanding limited generalizability, which will in any case require replications in future research, multiple implications for both fields of research can be found. First, findings related to consumers' perception of freemium in IS are scarce and inconsistent. Our research can possibly contribute to this inconsistency by establishing a prime motivation other researchers can build on. For example, findings that social exchange expectations (Oestreicher-Singer and Zalmanson 2013) are important in the decision-making process towards free or premium services contribute to the mechanisms of the ZPE. So it is possible that social features and social norms act differently in free and premium versions. Since only two (initial study) and one (main study) functionality-based features were investigated in our research, future research can overcome this limitation and explore new conditions of the freemium effect. Second, derived from a context where free products and services are often not naturally free (see above), the ZPE is initially applied to the freemium context. Our research showed a first picture of the consequences of the freemium effect. However, the underlying mechanisms and moderators cannot be studied in one single piece of research. For example, which of the three mechanisms (social exchange norms, reference prices, emotions) has the strongest effect on the quality-price relationship? Our results regarding the WTP indicate that the reference price mechanism (Thaler 1985) is plausible but detangling all mechanisms is a difficult research object yet to be achieved. However, free offers, illegal downloading, or non-commercial alternatives (e.g., Open Source) possibly affected reference prices. Consequently, moderators such as the "free mentality" (Lin et al. 2013) should be integrated by subsequent research. Further, our research design focused on single offers instead of different options. Subsequent research should investigate how the differences between two or multiple options frame the decision-making process. Another issue raised from our design is that the prices provided in the treatments may have anchored the respondent's WTP as references. This anchoring effect can inspire new research, for example by comparing pre- and post-treatment WTP. The donation-based offers frequently

used for Open Source are also a viable starting point for comparable research that for example applies the "pay what you want" approach (e.g., Kim et al. 2009). In the same vein, other mechanisms should be researched, for example by capturing emotional reactions or differentiating unexpected and expected free offers. Third, our research is limited to a narrow amount of service features. How differences in the importance of features or their nature frame the freemium effect so far remains unexplored. For example, a rather complex hierarchy of features restricted to different versions of a business-oriented freemium social network (e.g., LinkedIn or the German XING) and non-functional features (e.g., support, failure insurance) seem to justify further investigations. Our research limitations call for further research as well. Spotify and Dropbox are two examples of successful freemium business models. However, other freemium services (e.g., LinkedIn, Skype, mobile apps) and related business models (e.g., free-to-play games with in-game paid content) should also be investigated to replicate the freemium effect and reveal possible moderators. In line with the findings that European consumers have been found to associate a stronger relationship between quality and price (Voelckner and Hoffmann 2007) and that cultural values play a crucial role in technology adoption (e.g., Zhang and Maruping 2008), replications in other areas of the world (e.g., Asia and North America) could be insightful. Finally, WTP has been measured via a direct (van Westendorp 1976) rather than an indirect (lottery, auctions, conjoint designs) approach. Contrary to the advantage of survey simplicity, our approach bears the possible shortcoming of limited reliability and validity (low correlations with real behavior; e.g., Miller et al. 2011). We welcome and look forward to future investigations that use indirect approaches to replicate or advance our findings.

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