

Handel und Internationales Marketing  
Retailing and International Marketing  
Bernhard Swoboda · Thomas Foscht  
Hanna Schramm-Klein *Hrsg.*

RESEARCH

Robér Rollin

# Essays on congruence theory in marketing

Special focus on digital products and  
webstores



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## **Retailing and International Marketing**

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Robér Rollin  
Weimar, Germany

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# Abbreviations

ANOVA	Analysis of Variance
App	Mobile Application
AVE	Average Variance Extracted
$\beta$	Unstandardized Beta Value
DLC	Download Content
eSports	Electronic Sports
F	F-statistic
H	Hypothesis
M	Mean
N	Sample Size
n.s.	Not Significant
NFI	Normed Fit Index
p	p-value
PAD	Pleasure-Arousal-Dominance Scale
PLS	Partial Least Squares
$R^2$	R-squared (Coefficient of Determination)
SD	Standard Deviation
SEM	Structural Equation Model
SPSS	Statistical Package for the Social Sciences
SRMR	Standardized Root Mean Square Residual
Std. Error	Standard Error
VIF	Variance Inflation Factor



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# Introduction

# 1

## 1.1 Relevance and Focus

Digital products are intangible goods, mainly presented visually and acoustically to consumers in the form of videos, images, texts, and music that can be bought, downloaded, or streamed via various web stores. Their consumption primarily fulfills hedonic needs. Before purchasing, a consumer's interaction with a digital product is always mediated by technology like a computer or mobile device (Reinartz et al., 2019). Therefore, consumers cannot directly judge the quality through "touch and feel" experiences. This issue diminishes the ability to evaluate digital products (Jiang and Benbasat, 2004), especially hedonic products like video games or movies. Research shows that consumers prefer to purchase utilitarian products, such as tools and household items, rather than hedonic products because indirectly evaluating the products' quality is challenging (Gupta et al., 2004). Consumers cannot be sure that a digital product will fulfill their hedonic needs before actively using it (Kannan and Li, 2016; Yuping, 2019). Based on the findings of Voss et al. (2003) as well as Hennig-Thurau and Walsh (2004), consumers' evaluation processes and purchase intentions regarding digital products often rely on information that signals a certain quality.

Nevertheless, consumers have expectations regarding the functionality and usability of digital products. Therefore, purchase intention and evaluation are based on cues congruent with expectations, such as product and social attributes. In general, the internet provides a variety of product attributes (icons, screenshots, and photos) and social attributes (via social networks and review websites) to evaluate the functionality, usability, and overall quality of a specific digital product in advance. Product attributes typically define the product itself, such as design, genre, or product category, that if altered, would change the product's

nature. However, social attributes are attached but not inherent to the product itself, such as publisher reputation, reviews, and critiques. For example, a consumer may consider critics' recommendations or visual impressions to evaluate a digital product and form certain expectations (Voss et al., 2003; Hennig-Thurau and Walsh, 2004). Therefore, online marketing research and practice explore how publishers should design these cues (product and social attributes) to indicate product quality to consumers. Unfortunately, there is a lack of current research fully characterizing the impact of different product attributes, such as icons, genres, age restrictions, and price as well as social attributes like the community's average rating and communication channels, on consumers' evaluation process and purchase intentions, leading them to buy, download, or stream a particular digital product. As mentioned by Yuping (2019), it is of empirical relevance to study consumer heuristics in an information-intensive digital environment and to describe the influential factors on consumer response.

Furthermore, this topic has great economic potential. Digital products are purchased and consumed via web stores, such as iTunes or Google Play, and streaming services like Twitch, YouTube, and Netflix. These platforms contribute to the increasing prevalence of online shopping behaviour, while consumers evaluate and purchase products through digital channels more frequently (451 Research, 2018; US Census Bureau, 2020). One of the most popular web stores is iTunes, allowing consumers to purchase digital products like video games, songs, and books for their computers or mobile devices. Furthermore, streaming services like YouTube and Netflix allow consumers to access a plethora of media, including shows, series, and movies, for free or via a subscription-based pricing model.

The rapid growth of technology and services in past decades undoubtedly had a significant impact on consumers' lives. In 2021, smartphone owners worldwide have grown to 3.8 billion. Therefore, about 48% of the world's population owns a smartphone (Statista, 2021a). In 2020, about 2.1 billion people regularly watched YouTube videos. YouTube is most popular among young people, who access the platform several times a day for entertainment and news content. In addition, electronic sports events (eSports) and Let's-Play videos are gaining popularity via streaming services, with about half a billion viewers worldwide, becoming the two most important streaming genres (Statista, 2021b). Buying digital products has become a part of daily life for many people worldwide. The rise of these web stores impacts consumer usage and affects corporate research, development, and marketing processes for new products. Therefore, there is a need for a more in-depth understanding of consumer evaluation processes and purchase intentions regarding digital products, allowing companies to benefit from

the growing importance of web stores from a management perspective. This thesis seeks to answer the following research questions to understand how product and social attributes indicate product quality and form consumer evaluation and purchase intentions.

**RQ1:** How should cues, such as product and social attributes, be designed and used to convey product quality and form consumer evaluation, leading to a purchase intention?

This thesis establishes a theoretical framework to answer this research question, exploring and examining the most influential product attributes on consumer-related outcome variables, like the emotional responses, attitudinal formation, and behavioural change, with regard to the mediating factor of consumers' emotions.

**RQ2:** To what extent overshadow social attributes the importance of product attributes with regard to consumer behaviour, and how can publishers actively stimulate and manage community activity?

The research addresses the second question in two additional essays analyzing community behaviour and the intention to join a specific community through experimental studies and marketing data analytics. In answering these two research questions, this thesis widens the understanding of online marketing and consumer behaviour.

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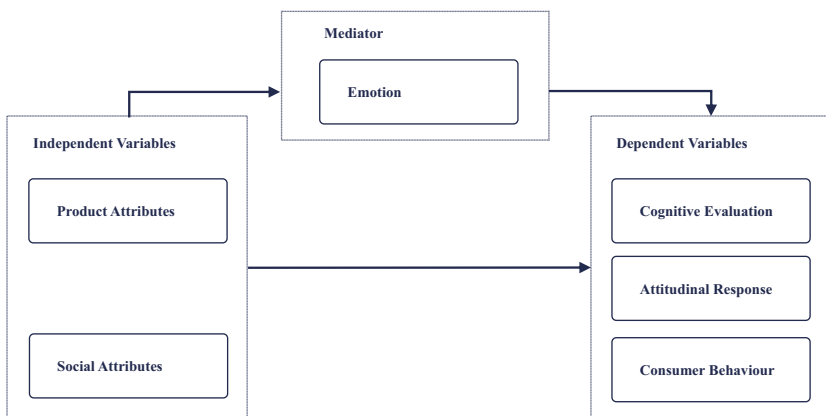
## 1.2 Theoretical Foundation

The assumption that consumer evaluation processes and purchase intentions depend on cues is based on signal theory, according to Kirmani and Rao (2000). Their theory provides a marketing research framework to understand the relationship between publishers and consumers with limited information in a pre-purchase context. Information asymmetry is significant in the hedonic digital products context due to the lack of haptic impressions. A signal is a cue that conveys unobservable product quality information to the consumer. These cues are generally divided into two groups: intrinsic and extrinsic. Intrinsic signals are product attributes that define the product, such as its design, genre, or product category, and would change the product's nature if altered. Extrinsic signals are product-related features not inherent to the product itself, such as publisher reputation, reviews, and critiques. Based on signal theory, consumers use both

(intrinsic and extrinsic cues) to judge product quality (Kirmani and Rao, 2000). In the context of digital products, two categories, “product attributes” and “social attributes,” are used as synonyms for intrinsic and extrinsic cues. In this thesis, both categories constitute the research framework’s independent variables (Figure 1.1).

Signal theory addresses the relationship between these cues and the consumer’s evaluation process and purchase intention. However, to gain a deeper understanding of consumers’ evaluation processes and purchase intentions, this thesis also examines the impact of signal theory on several consumer-related outcome variables (as dependent variables) in more detail: emotional reactions, attitudinal formations, and behavioural changes (Ganesh et al., 2010; Wang et al., 2011). The congruence theory of Osgood and Tannenbaum (1955) also supports the causal relationship between variables. The authors define congruence as the agreement or similarity of several objects consistent with each other or having a structural correspondence based on related expectations (Maille and Fleck, 2011). Applying the basic assumptions of congruence theory to the context of digital products should encourage consumers to positively value combinations of product and social attributes that represent a coherent overall appearance. For example, it is unlikely that a digital product with an esthetically ugly visual appearance would result in high-quality expectations. In particular, the literature highlights the importance of schemata (the structure of prior knowledge), as they impact the evaluation of congruence on consumer-based expectations (Mandler, 1982; Stayman et al., 1992). The positive effects of congruence are explained by the assumption that individuals value the combination’s harmony, either in general or specific elements of the combined objects (Osgood and Tannenbaum, 1955). Therefore, the literature suggests that in both cases, the convergence of assumptions or perceptions leads to positive processing and evaluation and favorable outcomes for several consumer-related variables, such as consumers’ evaluation processes and behaviour, as dependent variables for the research framework. The assumption that congruence between different product and social attributes within an item positively influences consumers’ responses is also supported by the Kamis (1990) “match up” hypothesis. This hypothesis states that combinations of elements within an object’s setting, such as an advertisement or product logo within a show, are more effective with a high degree of “fit” or congruence between product and social attributes. In this study’s context, such a high degree of congruence should trigger positive emotions, leading to more positive perception and positively mediating consumers’ evaluation processes, attitudinal formation, and behaviour. Furthermore, these stated relationships are confirmed by the categorization theory according to Cohen and Basu (1987). Consumers

rely on a cognitive category formed by previous experiences with similar products, defining the quality of new products. Previous psychology studies recognize this categorization process as a fundamental human cognitive and behavioural activity (Rosch et al. 1976; Sujan, 1985). Whenever a consumer is confronted with a new product, it is categorized as part of a previously defined category based on its product and social attributes. According to Cohen and Basu (1987), consumers generally prefer new products (including digital products) categorized into a highly preferred group. Consumers further prefer products requiring only a moderate cognitive effort to categorize. For example, if the consumer perceives the product attributes as very unusual, unique, and strange, these effects can lead to an aversion toward the product due to the associated risk of a failed purchase. Therefore, consumers look for information that signals certain product features to reduce this purchase risk when categorizing new products. Barsalou (1992) shows that visual appearance is a key determinant of category membership that can overshadow semantic information (Snodgrass and McCullough, 1986). In summary, these theories emphasize the importance of the variables, consumer emotion, evaluation, attitudinal formation, and behaviour in a pre-purchase context regarding information asymmetry between consumers and publishers. Therefore, these consumer-related outcome variables are utilized as independent variables in this research framework.



**Figure 1.1** General Conceptual Framework

The degree of congruence between product and social attributes is addressed as a success driver in the first and fourth essays. Essays two and three investigate the extent that the perceived congruence of product attributes (especially regarding visual appearance) impacts certain consumer-related outcome variables. Finally, essay five investigates the consumer mechanisms of joining a community and actively communicating with other participants. While the theoretical framework proposes the basic concept of this thesis, each essay is accompanied by a grounded research framework relating to the essay's specific context and building on its corresponding research questions. Each essay's specific research questions are presented in the following chapter.

### 1.3 Research Gaps

As discussed above, this thesis focuses on the success drivers of digital products by analyzing consumer behaviour. This thesis aims to obtain a deeper understanding of consumers' evaluation processes and purchase intentions. Thus, the thesis contains four sections (see Table 1.1).

**Table 1.1** General Research Goals

<b>Topics of Interest in context of digital products</b>	<b>Essay 1</b>	<b>Essay 2</b>	<b>Essay 3</b>	<b>Essay 4</b>	<b>Essay 5</b>
A deeper understanding...					
... which product attributes influence consumer choice.	x				
... how product attributes positively influence consumer's cognitive processing and expectations.		x	x		
... to what extent, the visual representation of digital products influences consumer's behaviour.	x	x	x		
... to what extent social attributes have an influence on market success.	x			x	x

First, the thesis strives to analyze the utility generated by specific product and social attributes to determine their importance in influencing consumer behaviour (Jung et al., 2012; Garg and Telang, 2013; Ghose and Han, 2014). Second, an investigation of the visual representation of digital products focuses on colours and esthetics. Research has shown that one of the most important design elements



of a product's visual representation is its colour, affecting consumer expectations and evaluations (Hine, 1997). Colours have a significant impact on the effectiveness of advertisements, brand personality evaluation, the emotions experienced, and purchase intentions (Gorn et al., 1997; Valdez and Mehrabian, 1994). Third, this thesis investigates community reviews and communication channels. Consumers often rely on reviews to reduce the risk of a purchase failure. Based on previous research, positive community reviews generate positive expectations toward products and lead to purchase intentions (Binken and Stremersch, 2009; Cox, 2013). These research goals align with the proposed relationships in the general conceptual framework. However, each essay asks several more specific research questions. An overview will be successively presented in the following chapter.

Previous research in psychology recognizes the categorization process as a fundamental human perception and behaviour activity (Rosch et al., 1976; Sujan, 1985). By applying categorisation theory in accordance with Cohen and Basu (1987), each digital product has unique characteristics like functionality, ease of use, consumer interface and visual style which can be hard to assess before the consumer actually uses it (Duan et al., 2009; Liu et al., 2014). To reduce this purchase risk, consumers look for information that signals certain product characteristics to categorise new digital products. For example, offering free trial versions of a digital product, even with limited features, can reduce the perceived purchase risk for a customer (Liu et al., 2014). Consumers can test the digital product for free and easily judge whether it fulfills their hedonic needs. Therefore, even the revenue model can be used as a signal in certain digital products to be preferred or rejected by consumers. Icons, screenshots, and photos are also important elements for the categorization process, given that icons (especially for mobile device apps) are a digital product's first visual representations. Barsalou (1992) shows that a product's visual appearance and esthetic are important determinants of category membership and overshadow semantic information (Snodgrass and McCullough, 1986). Consumers are also influenced by reviewers and critics while judging the overall product quality (Jiang et al., 2009; Kalish, 1985; Kapil and Robert, 2004). However, the results of previous studies do not fully identify the attributes impacting the selection decision. The utility generated by product and social attributes remains unclear from consumers' perspective.

■ This thesis expands the findings in the field of human behaviour and information systems by investigating the impact of product and social attributes, on consumers' choices.

In the context of online consumers' behaviour, the results of Lothia et al. (2003) show that the colours used by a website significantly influence the click-through rates. The results of Nitse et al. (2004) also suggest that the colours used in a digital product's online presentation manifest certain expectations. However, a provider failing to meet these expectations negatively affects consumer satisfaction and repurchase intentions. Furthermore, Bellizzi and Hite (1992) and Lichtlé (2007) show that colours attract consumers' attention based on certain perceptual qualities, influencing several consumer-related outcome variables like emotional and attitudinal formations. In this context, colours are often related to the perception and evaluation of a product's esthetic appeal and trigger consumers' cognitive processes (Bonnardel et al., 2011; Coursaris and van Osch, 2016; Deng et al., 2010).

Nevertheless, these studies, and research in consumer psychology, mainly focus on the influence of specific colour dimensions (hue, saturation, and brightness) on consumer responses (Bellizzi and Hite, 1992; Gorn et al., 1997; Bagchi and Cheema, 2013). The previously mentioned studies focus on single colours and do not consider the relationships between colours or colour harmonies. Only a few studies (Noiwan and Norciom, 2006; Deng et al., 2010; Schloss and Palmer, 2011) examine the effects of colour combinations on consumer responses. Their results suggest that most consumers prefer a combination of similar colours, resulting in analogous colour contrast because such combinations are perceived as more congruent, harmonious, and esthetically appealing. According to the basic assumptions of congruence theory (Osgood and Tannenbaum, 1955), research supports that a congruent stimulus, such as combinations of similar colours, leads to a more positive perception and evaluation of an object than an incongruent stimulus (Till and Busler, 2000).

■ This thesis addresses the research question of whether a more esthetically pleasing digital product leads to a more positive perception and evaluation of the associated product.

Many studies confirm that the intention to purchase a product is strongly related to the expectation of the product's quality (Ridings and Gefen, 2004; Wasko and Faraj, 2005). Therefore, social attributes (in addition to product attributes) are becoming increasingly important in marketing research, especially for hedonic goods. Generating positive emotions (Hirschman and Holbrook, 1982) and joyful and pleasant experiences (Marchand and Hennig-Thurau, 2013) is the primary purpose of hedonic products. However, consumers can experience significant uncertainty regarding hedonic digital products' potential to fulfill such a purpose. Uncertainty in buyer-seller relationships usually occurs due to

information asymmetries about the product and the seller (Ghose et al., 2006). Sharing experiences within a community through communication channels can reduce this asymmetry. Nowadays, consumers follow discussions on numerous online forums, social networks, or streaming services to get new information about digital products (Bateman et al., 2011; Kuk, 2006; Millen et al., 2002), usually resulting in motivating them to participate. These interdependencies are consistent with theories of network effects (Beck, 2006), proposing that the value to consumers of membership in a network is positively affected when new consumers join and expand the network (Katz and Shapiro, 1994). Consequently, the utility of consuming a digital product is positively related to the total number of consumers already actively using it (Church et al., 2008). Thus, based on previous thinking, benefits through social interactions are important (Butler et al., 2014; Wasko and Faraj, 2005), as they directly affect consumers' expectations of digital products, such as those based on consumer reviews and discussions on the product's webpage prior to purchasing, perceived performance and intention to use.

■ It is important to gain a better understanding of social attributes, especially social attributes of digital products, as they may need to be considered more frequently in future research studies.

In the context of streaming services, such as YouTube and Twitch, consumers use communication features, such as chat functions, to interact with other consumers and broadcasters (Scheibe et al., 2016; Friedlaender, 2017). These social interaction opportunities can be quite important to the success of streaming services (Hess, 2014). Therefore, researchers attempt to identify the success factors for consumer engagement in online communities (Ross et al., 2009; Hars and Ou, 2002; Meng et al., 2015; Tsai and Bagozzi, 2014). These studies find that the quality of consumers' social interaction, community size, and social ties are the most important factors in understanding consumers' intentions to participate (Lin and Lu, 2011; Shen et al., 2014; Shriver et al., 2013; Zhang et al., 2017). Therefore, communication features that lead to interactions with other consumers could be an important success factor for digital products and streaming services. So far, marketing research has investigated the motivational factors of consumers and senders in sharing their knowledge (Bründl et al., 2017; Hamilton et al., 2014; Hilvert-Bruce et al., 2018; Zhao et al., 2018). However, the research does not fully explore the importance of these communication channels and the motivational factors for community participation.

■ Therefore, this thesis aims to expand the understanding of how social factors influence consumers' decision-making processes in participating within a community.

Based on the preceding considerations, this thesis strives to answer relevant research questions in key areas about consumers' purchase process of digital products. Examining several areas of these specific questions and phenomena adds meaningful knowledge to previous research and establishes new foundations for further research. Moreover, these research questions are consistent with practical problems in the digital world, so academics and practitioners will benefit from the findings and implications of this thesis.



# Structure and Content of the Essays

# 2

## 2.1 Focus of the Essays

The primary goal of this thesis is to enhance the understanding of consumer-related outcome variables and consumer behaviour in the context of digital products. The five essays (see Table 2.1) focus on the four previously explained research targets, with relevant questions for marketing literature and management. This chapter presents summaries of the five essays, providing an overview of the thesis.

**Table 2.1** Essay Overview

<i>Essay Title</i>	<i>Case Study</i>
Drivers of Market Success for Mobile Apps	Mobile Apps
The Role of Colour Contrast and Predominant Primary Colour of Icons for Mobile Gaming Apps in Influencing User Reactions	Mobile Gaming Apps
The Role of Visual Congruence for Brands in Influencing Consumer Behaviour	Brands, Social Networks, Video Games, Streaming Services, Webstores
The Need for a Community: The Impact of Social Attributes on Video Game Success	Video Games
Interaction in Social Live Streaming Services	Streaming Services

The first essay takes an exploratory approach to identify and investigate attributes that significantly influence consumers' choice of digital products, using mobile gaming apps as the experimental study's example. Mobile apps have

gained tremendous popularity in recent years and gaming apps are the most popular and profitable app category (Statista, 2021c). Therefore, the first essay extends the human behaviour and information systems findings by examining product attributes of mobile gaming apps that impact consumer choice and gaining insights into the utility of specific attributes of mobile gaming apps by using a choice-based conjoint experiment. Finally, the results show the interchangeable product attributes from the consumer perspective. Based on these results, the second essay focuses on the visual representation of a digital product or mobile gaming app, as icons significantly influence consumers' choice decision. More specifically, the second essay analyses the effects of an icon's colours and colour contrast on consumers' experienced emotions, their attitude toward the icon, and consumers' intention to download the mobile gaming app. The third essay focuses on the impact of visual congruence (colour harmony and aesthetic appeal) of several digital products on consumer-related outcome variables. The results demonstrate the influence of colour and colour contrast on consumers' perception and evaluation of a digital product by conducting five experiments with different digital products and presentation techniques (a company logo, a social media account, a mobile app, a streaming service, and an online store). According to Algharabat et al. (2018) and Kapoor et al. (2018), the case studies of this third essay are typical consumer touchpoints with a brand or product in a digital environment. They allow companies to engage with their customers to improve emotional and attitudinal formations, brand awareness, and increase sales. In essays four and five, the research focuses on social attributes, specifically the importance of a community on consumer expectations. Essay four provides insights into social interactions as success factors for video games and appropriately addresses management implications for enhancing and moderating these social interactions. Video games are increasingly enjoyed as a collaborative social experience, and consumers are keen to discuss and share knowledge about their favorite games. Therefore, essay four address the relative importance of social attributes as success drivers for video games. Essay five examine the motivational factors for consumers to join a community and share their knowledge. Numerous studies address consumer interaction behaviour with each other but neglect the area of communication between consumer and producer. In particular, social networks and streaming services enable direct communication between viewers and broadcasters. This interaction might significantly motivate a consumer to join a specific community. The implications of such an interaction are explored in essay five. The following subsections summarize each essay's central research questions and methodology, in addition to the main findings and contributions.

## 2.2 Drivers of Market Success for Mobile Apps

The first essay adopts an exploratory approach to uncover and analyze the characteristics that significantly influence consumers' choice decision of a mobile gaming app, based on Cohen and Basu's (1987) cognitive categorization theory. Mobile apps have gained tremendous popularity and more than 140 billion apps have already been downloaded from an app store, generating \$28 billion in revenue. Gaming apps are by far the most popular and profitable app category, accounting for about 25 percent of all available apps (Statista, 2021c). From a research perspective, it is also important to analyze the utility generated by these attributes to make a statement about their impact on consumers' decision to download a mobile gaming app. Garg and Telang (2013) have shown that the price of a mobile app has a negative impact on the number of downloads. Furthermore, Ghose and Han (2014) collected publicly available data such as file size, number of apps from the same developer, ratings, in-app purchase options, price, and possible age restrictions to build a structural econometric model to estimate consumer's preferences. Most of the attributes had a significant impact on the estimated number of downloads. Jung et al. (2012) used a parametric survival analysis to examine the success drivers of mobile gaming apps. The authors measured the length of time between a new app entering and exiting the Korean top 100 free and high-priced app charts as the dependent variable. The results showed a significant influence of price as well as an influence of ratings provided and app size. A similar approach (focusing on the rank position) was conducted by Lee and Raghu (2014). The authors tracked individual apps and their presence in the top 300 charts and showed an influence of price, ratings, and number of apps from the same app developer. In addition, Liu et al. (2014) calculated a regression model showing a significant impact of price, app category, and app size on the estimated number of downloads. Nevertheless there is still a lack of research that fully explains the influence of product attributes (e.g., icon, genre, age restriction, price, and in-app purchases) and social attributes (e.g., average rating and number of reviews) on a given consumer's overall decision to download a particular mobile gaming app. Based on Cohen and Basu's (1987) cognitive categorization theory, this essay conducted an exploratory approach to find and examine the attributes that significantly influence the choice decision to download a mobile gaming app. Through a choice-based conjoint experiment ( $N = 503$ ) based on Hauser and Urban's (1977) multi-attribute utility theory, the product attributes and social attributes of a given mobile gaming app were systematically manipulated to gain a deeper understanding of the perceived utility of each attribute by the consumer. Each participant reported owning at least one

mobile device (e.g., a tablet computer or smartphone) with the ability to access an app store and download and use mobile apps. To calculate the utility for each level and attribute 20,000 iterations were calculated through a Hierarchical Bayes routine (Arora and Huber 2001). Therefore, the individual utility value for each level and each attribute were determined on a scale of  $-100$  to  $100$ . The results of the choice-based conjoint experiment show that the icon, genre, and the price for the mobile gaming app are the most important attributes for the consumer's choice. Barsalou (1992) has already confirmed that the visual appearance of a given product is one of the most important features of the categorization process according to Cohen and Basu's (1987) categorization theory. Based on the findings the essay confirms this statement showing that the icon of a mobile gaming app is a very important attribute to increase the perceived usefulness. This is particularly interesting because an icon can be completely designed by the developer without rather any restrictions imposed by the app store.

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### **2.3 The Role of Colour Contrast and Predominant Primary Colour of Icons for Mobile Gaming Apps in Influencing Consumer Reactions**

Given the enormous potential and the expected growth of the mobile gaming app market, the question arises how mobile gaming apps should be designed to trigger market success. Research has shown that packaging design has an impact on consumer's attention towards products and influence purchase decisions (Folkes and Matta 2004, Underwood et al. 2001), which is consistent with the findings of the first essay. One of the most important design elements of product packaging, that affects product expectations and evaluation, is its colour (e.g., Hine 1997). Colours have a significant impact on consumer's expectations, brand personality perceptions, experienced emotions, and purchase intention (Gorn et al. 1997; Valdez and Mehrabian 1994). The findings of Nitse et al. (2004) especially addressed the effects of colours on consumer's expectations about the digital product. When an online store provider fails to meet these expectations, it has a negative impact on consumer's satisfaction and purchasing behaviour. Furthermore, Bellizzi and Hite (1992) and Lichtlé (2007) have shown that colours attract consumer's attention based on certain perceptual qualities that further influence their attitude towards a product. Colours are often related to the perception and evaluation of the esthetic appeal of a digital product, website, or object in general, and can trigger consumers' cognitive processes, related to a presented object, e.g., in an online store (Bonnardel et al. 2011; Coursaris and van Osch



2016; Deng et al. 2010). Based on these findings, this essay also addressed the potential impact of the colour (used in an icon of a mobile gaming app) on consumers' expectation and evaluations, and also affects their intention to download the mobile gaming app. Nevertheless, the previously mentioned studies focused on single colours, not on colour combinations, and therefore did not consider the relationships between colours. However, most visual stimuli that consumers perceive are rarely monochromatic. Consequently, there is a lack of research examining the influence of colour combinations and the resulting contrast (e.g., analogous or complementary) on consumer responses. According to the findings by Schloss and Palmer's (2011), consumers prefer colours that are getting perceived as more congruent, and esthetically pleasing rather than incongruent colour combinations. Therefore, this essay proposes that analogous colour contrast—combinations of similar, congruent colours—in an icon of a mobile gaming app leads to a more positive perception and evaluation of the associated game, and furthermore has a positive impact on several consumer related outcome variables like consumers' experienced emotions, attitudinal formations, brand personality, and download intentions. To test those hypotheses a 2x3 between subject design ( $N = 172$ ) was conducted, by manipulating the factors icon colour contrast (factor 1: analogous contrast vs. complementary contrast) and predominant primary icon colour (factor 2: yellow vs. red vs. blue) of two mobile gaming apps. Participants were randomly and evenly assigned to one of the six experimental conditions in an online experiment. The results indicate that an analogous colour contrasts in mobile gaming app icons has a positive direct effect on the emotional dimensions of pleasure, arousal, and dominance. Moreover, the use of an analogous contrast positively affects the hedonic aspects of the attitude toward the icon, while the utilitarian dimension of attitude is not affected by the type of contrast.

Moreover, the results of the present study indicate that the use of an analogous colour contrast in the icon of mobile gaming apps positively affects several personality dimensions related to the icon and possibly also to the mobile gaming app itself. At least, the results of the essay also suggest that the use of an analogous colour contrast in a mobile gaming app icon leads to higher download intention. In this regard, the results are consistent with the findings of Gorn et al. (1997) and Schloss and Palmer (2011), who also showed that combinations of similar, congruent colours within a stimulus lead to positive consumer-related responses. App developers, publishers, and app store providers can consider the results to better attract consumers through effective, efficient, and appealing icon design. The results show that an analogous colour contrast in an icon of a mobile gaming app leads to positive effects as they positively influence consumer-related outcomes variables.

## **2.4 The Role of Visual Congruence for Brands in Influencing Consumer Behaviour**

To further investigate the influence of different colour combinations on consumer expectation, perception and behaviour, the research design from the second essay was adapted to digital products and advertising in general in essay 3. Colours attract consumers' attention, trigger certain associations and subsequently change consumer behaviour (Macklin 1996, Hine 1997, Lee et al. 2014, Bagchi and Cheema 2013, Hagtvedt and Brasel 2017). The relevant literature shows how the deliberate use of colour has a direct impact on esthetic appeal and therefore brand equity. For example, the colour red used in a logo is perceived as particularly exciting, while the colour blue is more associated with competence and trust. Meanwhile, the colour yellow was found to have no effect on consumer-related outcome variables (Labrecque and Milne 2012). In addition, the colour red was found to elicit a higher level of arousal than the colour blue in terms of consumer emotional response. However, a higher level of arousal does not necessarily lead to a positive change in consumer behaviour. For example, when products are presented against a blue background, they are evaluated more positively than products presented against a red background (Bellizzi and Hite 1992), while a red background increases consumers' willingness to pay (Bagchi and Cheema 2013).

In the context of advertisements, research findings by Lothia et al. (2003) showed that the colours used in advertising banners affect click-through rate. In addition, a study by Nitse et al. (2004) found that colours also influence quality expectations of the advertised product, which affects both consumer satisfaction and purchase behaviour. However, all the above studies mostly focused on monochrome objects and ignored the influence of colour combinations. Based on the results of the second paper, such an approach is very important because most visual stimuli perceived by consumers are rarely monochromatic. For example, there are different colours within a company logo (e.g., "McDonald's" with a yellow letter in front of a red background), images published on a website or a social media platform can create different colour contrasts (such as the official Instagram channel of Apple Inc. or Adidas AG, both of which are quite colourful). A similar phenomenon occurs when an advertisement is integrated into a website. Both objects are rarely adapted in a consistent colour scheme. Few studies have examined the effects of colour combinations on consumer's responses, such as Noiwan and Norcio (2006) and Deng et al. (2010). Both studies suggest that consumers prefer combinations of similar colours because they are perceived as more congruent, harmonious, and esthetically pleasing. Thus, based on the basic

assumptions of congruence theory (Osgood and Tannenbaum 1955), research agrees that congruent stimuli, e.g., combinations of certain elements, elicit more positive perceptions and evaluations of an object than incongruent stimuli (Till and Busler 2000). Therefore, the third essay includes five experiments with different stimuli and presentation techniques (e.g., a company logo, a social media account, a mobile app, and an online store) to investigate the influence of different colours and colour contrasts on consumers' expectation and perception of a brand. The results contribute to consumer research knowledge in many ways by systematically manipulating the predominant primary colour (first experimental factor) of an object and the colour contrast (second experimental factor) produced by a secondary colour. More specifically, the experiments examine how colour contrast in an object's visual appearance affects perceived colour harmony, esthetic appeal, consumer emotional response, consumer attitude formation, brand trust, and consumer behaviour. At the same time, the experiments explore how the predominant primary colour also affects these consumer-related dependent variables. The fifth experiment in particular provides information on how consumers perceive and cognitively process colours and colour contrasts—with the help of an eye-tracking experiment. In the first experiments, 181 participants took part in a 2x3 between-subjects experiment. They were randomly assigned to one of six experimental conditions. Within one experimental group, participants were presented with exactly one manipulated company logo from an unknown consulting agency. According to Perdue and Summers (1986), ANOVA tests were conducted to verify whether the intended manipulation of colour contrast in terms of analogous colour contrast vs. complementary colour contrast was successful. As expected, the results show that a company logo with an analogous colour contrast is perceived as more harmonious and esthetically pleasing than a company logo with a complementary colour contrast.

The second experiment involved 178 participants. Again, participants were randomly assigned to one of the six experimental conditions in a 2x3 between-subjects experiment. This time, the colours of product photos within an Instagram account were systematically manipulated. of a mobile device salesperson. Subjects were asked about their emotional response, attitude, and trust level toward the mobile device salesperson as they scrolled through the Instagram channel. The results show a significant positive effect of an analogous colour contrast on emotional response, attitude, and trust level, while the influence of the predominant primary colour (namely yellow, red, and blue) could not be empirically proven.

Furthermore, in the third experiment, an advertising banner within a mobile gaming app was placed at the bottom of the screen and, in accordance with our research design, visually manipulated to produce either an analogous or a complementary colour contrast to the graphics of the mobile gaming app itself. 180 undergraduates (63.3% female) were asked to play one of the six experimental conditions. The ad banner with a complementary colour contrast was closed more often and therefore displayed for a shorter time. The results could also be replicated across multiple play sessions. In summary, colour contrast directly changed consumer behaviour by actively closing the ad. Advertisers should therefore be aware of the impact of visual congruence between their advertisements and the displayed platform.

For the fourth experiment, the colours of a video on a YouTube channel were manipulated, according to the research design. The video was an explanatory film that contained only animated geometric shapes and text elements. 189 participants (52.9% female) were asked to watch the video with exactly one manipulation and then complete a questionnaire. Again, the questionnaire included questions about perceived colour harmony, esthetic appeal, emotions felt by the consumer, and consumer attitudes and trust in a brand. Again, the effects of colour contrast on the dependent variables could be replicated from the previous experiments. In addition, multiple ANOVAs also show a positive effect of analogous colour contrast on liking, sharing, and subscribing to the YouTube channel. An analogous colour contrast within a brand's online presence on a social media channel or YouTube channel positively influences non-monetary success factors, indirectly improving consumer loyalty to the brand.

In the fifth experiment ( $N = 262$ ), the colours of a fictitious online store were manipulated. In addition to the products, various graphic elements were uniformly coloured in shades of yellow, red or blue. In addition, a new clothing collection was advertised at the bottom of the online store. This element was coloured in shades of orange, purple, or green. According to our research design, these colour combinations create either an analogous or complementary colour contrast. In addition, the products displayed were adjusted for gender. Multiple ANOVAs were conducted indicating an influence of colour contrast on monetary success factors. Willingness to purchase was significantly higher among participants with an analogous colour contrast setting. Moreover, even the willingness to pay for the presented product increased by almost 35% on average.

To gain further insight, an eye-tracking experiment was conducted with a subsample of 52 participants using the same six manipulations, in line with our research design. Therefore, fifty-two students (75% female) participated on a voluntary basis. As expected, analysis of the SMI mobile phone recordings through

multiple ANOVAs revealed that the advertisement (in a complementary setting) was first fixated by the eyes 6 seconds later compared to an analogous setting. In addition, the number of fixations was also lower in a complementary setting. The results suggest that participants tend to avoid the manipulated advertisement in a complementary setting. Our results indicate that analogous colour contrast can positively influence several consumer-related outcomes. The experiments span multiple touchpoints that consumers may have with a brand. The results confirm that the visual appearance of a brand certainly plays an important role in consumers' perception and evaluation of a brand and triggers certain associations.

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## **2.5 The Need for a Community: The Impact of Social Attributes on Video Game Success**

In Essay 4, the research focus shifts from product attributes to social attributes. The studies examine the influence and importance of community activities on consumer expectations of a digital product. Therefore, Essay 4 offers insights into social interactions as success factors for video games and appropriately addresses management implications for enhancing and moderating these social interactions based on market data from the most popular video game distribution platform, steam.com. In general, video games have become enormously popular: The industry is one of the largest entertainment industries in the world, growing up \$180 billion in revenue (Marketwatch, 2021). In addition, the mobile gaming app market is the largest market segment (more than the console and PC game markets combined), accounting for up to 57% of global video game revenue. Furthermore, video games continue to reach new audiences and are becoming a widespread leisure activity. For example, about two-thirds of all US citizens play video games daily (businesswire, 2020).

The authors Herrewijn and Poels (2015) consider video games as the most popular entertainment platform at all. Nevertheless, from a research point of view, the success drivers of video games have not been investigated sufficiently. However, from the management point of view, such drivers are very important because the production costs of video games rise due to the increasing demands on graphics and processing power. For example, the production budget of "Grand Theft Auto V" was approximately \$250 million (IMDB, 2016), similar to high-budgeted movies. A commercial flop leads to significant financial losses. Therefore, the production of such high-quality video games represents a high financial risk for the developer. There is a great deal of uncertainty among developers because the drivers of success in video games have not been fully identified empirically.

Only a few studies address this issue. Gretz (2010) and Cox (2013), for example, have shown that the success of a particular video game depends mainly on social characteristics such as a high number of consumers, journalists' reviews, and the developer's reputation. Binken and Stremersch (2009) also demonstrated the positive influence of professional reviews on the success of a video game. It becomes clear that not only product attributes of video games (such as price, genre and graphics) have an influence on consumer expectation and purchase intention, but also social attributes like the community formed around a video game.

One explanation could be that social attributes strengthen interpersonal relationships and satisfy the need for connectedness with friends and peers in the digital world (Downie et al., 2008; Ledbetter and Kuznekoff, 2011). These assumptions are consistent with network effect theories (Beck, 2006). The research by Katz and Shapiro (1994) assumes that the value of consumer's membership in a network is positively influenced by new consumers. Consequently, the expectation and enjoyment of video games depends on the total number of consumers who already bought and play the video game (Church et al., 2008). Thus, the fourth essay primarily addresses the research questions how social characteristics affect the success of a particular video game and how these characteristics affect the average play time, which in turn could have a positive impact on revenue, based on network theory. To test the hypotheses empirically, a structural equation model was computed based on market data (provided by the distributions platform steam.com) from 401 video games. The results confirm the importance of social attributes for the purchase and re-usage intention. Therefore, video games are more than just a digital product that a consumer once buys at a fixed price. Instead, they become more a social experience where people from all over the world play together, communicate and share knowledge. Therefore, future research, as well as management, has to address social attributes beside the product attributes as success drivers.

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## **2.6 Interaction in Social Live Streaming Services**

The fifth paper also examines the influence of social characteristics on consumer behaviour, using streaming services as an example. Streaming service providers offer the possibility to rate and comment on content. This applies in particular to live streaming providers such as YouTube and Twitch. Here, consumers have the opportunity to provide feedback, share ideas and even influence live programming

through chat features. Therefore, Essay 5 investigated the motivation of individual consumers to actively participate in these communities. To date, research has not sufficiently explored the general importance of social attributes as a success factor for streaming services. Moreover, the different interactions with other consumers and the streaming service provider's program have not been considered in research so far. Nevertheless, some studies have attempted to identify success factors for consumer engagement in online communities and explain consumer behaviour in these communities (Ross et al., 2009; Hars and Ou, 2002; Meng et al., 2015; Tsai and Bagozzi, 2014). In these works, the quality of social interaction, community size, and consumers' social ties were found to be the most important factors influencing the use of online communities (Lin and Lu, 2011; Shen et al., 2014; Shriver et al., 2013; Zhang et al., 2017).

However, these findings have limited applicability to streaming services. Interaction within an online community relates exclusively to other consumers who are also members of the online community. However, current streaming providers also allow communication between consumers and the broadcaster. This can add to consumers' intention to participate and their sense of being part of the community. Therefore, this paper undertakes a first approach to extend the knowledge of social attributes as success factors for streaming services. Based on social identity theory and a literature review on social networks, two experimental studies were conducted.

The first study, a choice-based conjoint analysis as an online experiment was conducted in order to determine the importance of social attributes in relation to other product attribute of streaming services (e.g., image quality). The survey with 301 participants was distributed via certain social networks. Based on the results it becomes clear, that the image quality, price and language are the most important factors for consumers to choose a specific stream. The possibility to interact with other consumers and the broadcaster itself was less important. Study 2 was an online survey ( $N = 218$ ) that looked at the attributes that influence streaming service interaction intentions. Interaction motivation, perceived usefulness of streaming services, and rewards of involvement were all evaluated as potential attributes influencing the interaction intention, based on social identity theory.

The findings suggest that social relationships do play a significant positive role for the interaction and usage intention of streaming services. Furthermore, the included constructs had a considerable influence on interaction intention with other consumers, and the whole model's explanatory capacity adds to the study's value. Interaction with the sender was not as well explained by the model, but as an outcome variable, it had a respectable amount of explained variance. However, the perceived usefulness of a streaming service did not affect the interaction with

the broadcaster. The results show that social characteristics are an important factor to explain the intention to use streaming services. The results will help explore the applicability of social identity theory in this setting and identify future areas of research in information systems that address general consumer behaviour related to streaming services.

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## **2.7 Overview of Essays and Related Research Characteristics**

Table 2.2 provides an overview of the five essays and their corresponding research characteristics. For each essay, the research objective is summarized and information about the research design is provided. The sample size for each study and the different methods used are explained. In summary, more than 2.100 respondents were recruited to participate in online surveys or experimental studies and more than 700 video games and mobile apps were examined through market research. The essays test the causal relationships as proposed in the underlying conceptual frameworks to enhance knowledge for marketing research and consumer behavior as well as to imply meaningful implications for the management and practice.



**Table 2.2** Summary of Essays and Research Characteristics

	<b>Objective</b>	<b>Design</b>	<b>Sample Size</b>	<b>Methodology</b>
<b>Essay 1</b>	Investigate which attributes of a mobile app impact consumers' choice decision	Study 1: Market Data, Study 2: Online Survey	Study 1: N = 300 Study 2: N = 503	Study 1: Ordinal Regression Study 2: Choice Base-Conjoint Analysis
<b>Essay 2</b>	Investigate the impact of the icon colour contrast and of the predominant primary icon colour on consumer-related outcome variables	Study 1: Online Experiment	Study 1: 172	Study 1: ANOVA
<b>Essay 3</b>	Investigate how the visual appearance of an object affects the perceived colour harmony and how consumers perceive and cognitively process colours and colour contrasts	Study 1: Online Experiment Study 2: Online Experiment Study 3: Online Experiment Study 4: Online Experiment Study 5a: Analog Experiment Study 5b: Eye tracking experiment	Study 1:181 Study 2: 178 Study 3: 180 Study 4: 189 Study 5a: 262 Study 5b: 52	Study 1: ANOVA Study 2: ANOVA Study 3: ANOVA Study 4: ANOVA Study 5a: ANOVA Study 5b: ANOVA
<b>Essay 4</b>	Investigate the impact of social elements on video game success	Study 1: Market Data	Study 1: N = 401 (video games)	Study 1: PLS-SEM
<b>Essay 5</b>	Characterize the influential factors of interaction intention with community members	Study 1: Online survey Study 2: Online survey	Study 1: N = 301 Study 2: N = 218	Study 1: Choice Base-Conjoint Analysis; Study 2: PLS-SEM



## 3.1 Drivers of Market Success for Mobile Apps

### 3.1.1 Introduction

Mobile apps have gained tremendous popularity, as evidenced by the cumulative numbers of apps downloaded over the past decade. By the end of 2021, more than 140 billion apps will have been downloaded from app stores, generating \$28 billion in revenue. Gaming apps are the most popular and profitable app category, accounting for about 21% of the market (Statista, 2021c). In addition, mobile devices are the most important video game platform compared to consoles and computers. “Mobile” accounts for 57% of the entire video gaming revenue worldwide (Statista, 2021c). Searching for games on mobile devices and downloading these apps is the default method of video games consumption. With the proliferation of mobile phones, increasing affordability, and the casual use of these devices, the mobile platform reaches broader demographic segments and enables publishers to develop new gaming genre categories. For example, personal accounts, profiles, and social network connectivity provide a high degree of personalization and contextual awareness, such as geo-data for the mobile game “Pokémon Go.” From marketer’s and developer’s perspectives, publishing a mobile game requires additional steps compared to other gaming platforms, such as technical specifications, operating system, display size, user profiles, social network connectivity, and business model (freemium vs. paid content). Due to these new technological developments and consumer behaviour, examining how attributes determine consumer choice relative to this particular type of

app is required. Moreover, mobile games are characterized by their purely hedonistic nature. Therefore, consumers face an exceptionally high purchase risk, in a pre-purchase situation, as they cannot confirm whether they will like the game (Kannan and Li, 2016; Yuping, 2019). Thus, from the research perspective, it is essential to analyze the utility of a mobile gaming app generated by product and social attributes, to make a statement about consumer's purchasing decisions. Previous studies, which investigated the critical success attributes of mobile apps, already addressed some of these issues. Garg and Telang (2013) show that a mobile app's price negatively impacts the number of downloads. Their results also indicate that the app's chart position positively influences the number of downloads and the mobile app's revenue. However, attributes like the icon, reviews, genre, or in-app purchases are not considered. In contrast, Ghose and Han (2014) collected publicly available data like file size, the number of apps provided by the same app developer, reviews, in-app purchase options, price, and possible age restrictions to build a structural econometrical model, estimating consumer preferences. Most of the attributes significantly impact the estimated number of downloads. However, due to a lack of accurate market demand data, the authors use the estimated download numbers and the corresponding revenue for each app provided by third-party websites like [www.distimo.com](http://www.distimo.com) as the dependent variables. Unfortunately, the validity of the data cannot be verified. It is assumed that analytics firms like Distimo also estimate the number of downloads based on the mobile app's attributes. However, such an approach results in a tautological problem. The study's authors estimate the impact of app attributes (price and chart position) based on a variable (the estimated number of downloads provided by Distimo), also calculated through the apps' attributes.

Another research approach conducted by Jung et al. (2012) attempts to bypass this problem. These authors measured the time between a new app's entry and exit from the Korean top-100 "free and grossing" charts through a parametric survival analysis. The derived numbers are later used as a dependent variable for their study instead of the estimated downloads. Again, the results show a significant impact of price, reviews, and app size. Furthermore, Lee and Raghu (2014) employ a similar approach, focusing on the rank position. The authors track individual apps and their presence in the top-300 chart, showing an impact of price, reviews, and the number of apps from the same app developer. Although these attributes are considered valid and comprehensive, it is impossible to make a statement about the impact on the number of downloads or revenue. For example, an app surviving for one week in chart position "90" generates fewer downloads than an app surviving for one week in position "3". Therefore, discrimination

would seem necessary in calculating the impact of the app's attributes on the number of downloads. Furthermore, selecting independent attributes appears arbitrary and incomplete in these previous studies because they exclude potentially important attributes, such as icon, genre, and age restrictions. Moreover Liu et al. (2014) tracked the range of download counts for several months (presented by Google Playstores), as a solution for the lack of actual market data, providing an approximation of the actual number of downloads (for example, 50–100 downloads or 100–500) from 711 ranked apps. If an app is elevated to the next level, the authors note the date since the app's release date. Through these documented transitions, Liu et al. (2014) estimate a function for the relative number of downloads for a specific period. The calculated regression models show the significant impact of the app's price, category, and size on the estimated number of downloads. However, some potentially important attributes like reviews, in-app purchase options, and age restriction levels are not considered. In summarizing the previously mentioned studies, we see a research gap regarding the overall success drivers of mobile gaming apps.

- Therefore, this essay expands previous findings in human behaviour and information systems by investigating how product attributes, such as icon, genre, age restriction, price, in-app purchases, social attributes, average rating, and the number of reviews, influence consumers' decisions to download a particular mobile app.

In this context, the present study contributes to the knowledge of human behaviour in information systems in several ways. First, based on the cognitive categorization theory of Cohen and Basu (1987), we use an exploratory approach to find and verify the attributes significantly impacting the choice of a mobile gaming app. Furthermore, we conduct a choice-based conjoint experiment based on the multi-attribute utility theory of Hauser und Urban (1977), systematically manipulating these attributes to understand the perceived utility of different product attributes. More accurately, we expand the previous discussion's findings in human behaviour and information systems by 1) investigating attributes of a mobile gaming app that impact consumer choice, 2) gaining insights into the utility of specific attributes of mobile gaming apps, and 3) detecting interchangeable attributes from the perspective of consumers.

### 3.1.2 Conceptual Framework and Literature Review

We address the impact and utility of several app attributes and provide a theoretical explanation on why these attributes should influence consumer's choice intention. In an app store a consumer is confronted with various product attributes, as shown in Figure 3.1. Choice-based conjoint studies reveal that the importance of attributes differs within a product (Armel et al. 2008; Meißner et al. 2016; Milosavljevic et al. 2012). Therefore, in the context of mobile gaming apps not all attributes might be equally relevant for the consumer. We posit that product attributes (e.g., the icon, price, genre) and social attributes (e.g., average rating, number of reviews) influence the consumer's choice decision and perceived utility of the mobile gaming app.



**Figure 3.1** Example from a webpage of the mobile gaming app “The Game of Life”

Furthermore, we transfer the basic assumption of the categorization theory according to Cohen and Basu (1987) to conceptualize the effects. The essential premise of this theory is that consumers rely on a cognitive category, which was formed by previous experiences of products that are in turn used to define the utility of new products. Such a category is a group of products with many similarities. If a consumer gets confronted with a new product, this product will be categorized as part of a previously defined category.

Based on Cohen and Basu (1987) consumers should prefer new products, which are categorized in a highly preferred group, as well as products that require only a moderate level of cognitive effort to categorize at all. Furthermore, number of reviews), and measurable product attributes (e.g., genre, in-app purchases) influence the consumer's choice decision and perceived utility of the mobile gaming app, for example, if the product attributes are getting perceived as very uncommon and strange, these effects should also lead to an aversion to the product itself because of the associated risk of purchasing. Past studies in psychology recognize this categorization process as a fundamental activity for human cognition and behaviour (Rosch et al. 1976; Sujana 1985). We transfer this theory to our study because each mobile gaming app has certain unique features (e.g., gameplay, characters, settings and visual style), which can hardly be assessed before experiencing the mobile gaming app (Duan et al. 2009; Liu et al. 2014). To reduce this purchasing risk, consumers seek for information that signals certain product attributes to categorize new games. For example, different revenue models that exist in the app store environment could reduce the perceived purchasing risk. Besides paid versions of mobile gaming apps, there are also "freemium" apps, which are free to download, but either include in-app purchase options to unlock additional features or require some form of payment to free the app of advertisements that lessen the overall experience (Liu et al. 2014). For this reason, a free version should reduce the perceived purchasing risk, since the consumers can test the mobile gaming app for free and make an assessment more easily of whether or not the game is fun. However, in-app purchases could also negatively influence the gaming experience, because the consumers cannot use all functions without those in-app purchases. That is why the price, or, better yet, the revenue model itself could already be a signal for a certain type of a mobile gaming app that could be preferred or rejected by some consumers.

Another important element of a possible categorization process can be seen in the icon of a mobile gaming app, because icons are the first visual representations of the games in an app store. Barsalou (1992) showed that the visual appearance is a key determinant of category membership and could overshadow semantic information (Snodgrass and McCullough 1986). Based on this principle, genre as well as the age restriction level should also be important determinants, because both allow a first evaluation of the content and gameplay mechanics (Ghose and Han 2014). To address the game quality, consumers could also be influenced by reviews provided by other consumers who have already downloaded the mobile gaming app and experienced the gameplay. Such an impact on potentially new consumers has been extensively studied before through different hedonic markets (Jiang et al. 2009; Kalish 1985; Kapil and Robert 2004). Based on this

discussion it seems appropriate to claim that consumers are scanning the app store webpages (e.g., charts-list, new released-list and noteworthy-list) for these attributes to categorize mobile gaming apps into a cognitive category in order to make a choice decision. However, the findings of previous studies have not fully clarified which attributes have an influence on the choice decision at all. In addition, it also remains unclear what utility these attributes contribute in relation to each other. We assume that the attributes are not equally weighted and might be interchangeable.

In order to determine the important attributes for the choice and to define the contribution for the overall utility of a mobile gaming app, we conducted a choice-based conjoint experiment to analyze the utility function of the significant attributes reflected through a number of choice decisions by the participants. This method is based on the multi-attribute utility theory according to Hauser and Urban (1977). It is a systematic approach to quantify individual preferences for specific product alternatives by asking the participants multiple times to state their preferred product variation. Based on this theory, these stated preferences are derived as a balanced solution from the utility function. This utility function assumes that 1) the consumer is aware of the attribute levels, which should be the case because of the standardized presentation of mobile gaming apps within the app stores' websites and based on the categorization theory (Cohen and Basu 1987), 2) the consumer only considers attributes which are appropriate to categorize the game into a preferred group of mobile gaming apps. For a few decades such preference models have widely been used in the marketing discipline in order to understand the underlying consumer behaviour (Arora and Huber 2001; Kim et al. 2002; Roberts 2000). In the following, we will discuss in detail the possible success attributes that are known from earlier studies and are clearly displayed on the app store webpages, and therefore might affect the choice of consumers as well as the perceived utility of the mobile gaming app.

#### *Impact of the Icon on Consumers' Choice for Mobile Gaming Apps*

Icons are especially designed by game developers to attract the attention of potential consumers and should lead to a positive emotional response as well as a positive attitude towards mobile gaming apps. Therefore, they fulfill a similar function to the packaging design of any given product. In general research has shown that the purchase intention is highly dependent on the visual appearance of a product itself as well as the visual attention and emotions it causes in the consumers (Folkes and Matta 2004; Underwood et al. 2001). Furthermore, the packaging design is a way to communicate product attributes through specific design elements such as possible illustrations, colour, typography and shapes

(Clement 2007). In the field of human behaviour in information systems research has shown that the emotions experienced by consumers while interacting with a product in an online environment have an influence on the consumers' evaluation processes. Additionally, they also impact the overall satisfaction with the product (Sautter et al. 2005; Thüring and Mahlke 2007; Zhou et al. 2007). Steinmann et al. (2016) show a direct correlation between the colour harmony of the icon and the download intention of the game. Therefore, an esthetically pleasing icon could be an important source of sustainable competitive advantage. Also, based on the findings of Barsalou (1992), the visual appearance of a product is a key attribute of the category assignment based on the categorization theory by Cohen and Basu (1987), and should therefore be significantly influencing the consumers' choice. Depending on the presented characters, animals, objects and abstract symbols some icons might generate a more positive emotional response as well as attitude towards mobile gaming apps and their perceived utility.

#### *Impact of the Genre on Consumers' Choice for Mobile Gaming Apps*

Within the mobile game category there are about 18 different game genres, e.g., action, puzzle and family, in the common app stores. These genres are used to classify specific types of gameplay mechanics. Thus, each genre is associated with certain game rules and principles, which have been stored in the memory of the consumer based on previous experience. Especially in the context of mobile gaming apps, surprisingly little research has been conducted on the attribute genre within the discipline of human behaviour in information systems. Comparable research that has already been conducted in other fields or industries (e.g., movies and books) provides further evidence of genre as a very important influence on the buying intention (Austin and Gordon 1987; Desai and Basuroy 2005; Elberse and Eliashberg 1993). To address the findings of Austin and Gordon (1987) in the context of mobile gaming apps, the genre attribute should generate certain expectations, which will lead to preferences amongst consumer groups and affect the choice for new mobile gaming apps. The information consumers have about those genres varies from one genre to another. Consumers are subsequently more likely to memorize information about a genre that they prefer and more likely to dismiss any possible information about genres that they do not favor at all. This impacts the amount of cognitive effort that is required to categorize new mobile gaming apps from an uncommon genre. Based on the categorization theory by Cohen and Basu (1987), familiar genres should generally be the preferred choice of any given consumer, because of the higher amount of information and experience that consumers already have regarding these genres.



### *Impact of the Price and Revenue Model on Consumers' Choice for Mobile Gaming App*

It is not unusual to offer free versions or trials to reduce uncertainty and increase the willingness to buy or download a digital product (Cheng and Liu 2012; Kempf 1999). Grounded on the findings of several psychological experiment's consumers seem to overreact when confronted with a zero-priced product. This means that such a price does not only lead to a perceived low-cost product, but it also increases its assumed utility (Shampanier 2007). Furthermore, Palmeira (2011) also found a discontinuity in the cost-benefit evaluation by possible consumers that was verified by measuring the demand while the price for a given product was dropping to zero. Based on the findings of Kempf (1999) a free trial strategy might also stimulate consumers' demand for more digital content (e.g., features, levels and characters). This author argued that consumers who are more experienced with the digital product tend to show a more positive attitude, emotion and purchase intention for more content compared to those with no former experience, forming a choice decision based on reviews or personal recommendation. Based on these findings it is comprehensible that a large number of mobile gaming apps are available for free and only rely on the freemium business model. This model involves consumers downloading apps for free and instead charging them for additional features (e.g., new game characters, items or settings). Therefore, most games offered for free include in-app purchases, advertisements or hidden costs (Liu et al. 2014). The utility perceived from a free price could be reduced by in-app purchases as well as integrated advertisements. It is questionable to what extent the overall utility may fall again from such integrations. We also assume that there are some consumers that might reject the "freemium" business model completely and are more willing to pay a one-off fixed price. A similar group of consumers might also believe that a strong positive relationship exists between price and quality (Kardes et al. 2004). Consequently, the revenue model of a new mobile gaming app supports consumers' categorization process of mobile gaming apps into more or less enjoyable groups.

### *Impact of the Reviews on Consumers' Choice for Mobile Gaming Apps*

Reviews have become a simple and comprehensible method for consumers to judge the quality and potential enjoyment of an unknown mobile gaming app. Therefore, many game developers and publishers are using reviews as a marketing tool (Yin et al. 2012). For examples, the mobile gaming app "Candy Crush" proactively induces consumers to give a review about the gaming experience within the different app stores. In general, a lot of people consider online consumer-reviews to be trustworthy and a good indicator for the overall quality

of the product (Chen and Lurie 2013; Wu 2013). Therefore, the average rating of a mobile gaming app could have a great impact on the choice. Furthermore, Zhu and Zhang (2010) argue that popular products tend to receive more reviews and having a large number of reviews makes such a rating more trustworthy. Chen et al. (2004) also confirms that if the number of consumer reviews increases, the overall rating reflects the true quality of a product. Therefore, more reviews could more precisely reflect the product quality and consequently these reviews could become more persuasive. Based on the categorization theory some consumers require a certain minimum for the average rating of a mobile gaming app to categorize the app into a preferred group. This effect is weighted even more when other features like the icon or genre seem to be very unfamiliar and therefore require a high amount of cognitive effort to categorize.

#### *Impact of the Age Restriction on Consumers' Choice for Mobile Gaming Apps*

The age restriction of a given game is not set by an independent institute or the app store. The developers and publishers can specify those restrictions themselves. However, consumers have the possibility to report any game that they feel needs to have a different restriction level. In some cases, such a report could even lead to a removal of the game. Consistently, in the app stores, there are four restriction levels: “4 +,” “9 +,” “12 +” and “17 +”. For example, mobile gaming apps that include potentially offensive or sexual references must be rated “17 +”. Since apps in different levels of age restriction generally appeal to different segments of consumers, those restrictions can have very different impacts on possible demand for the app (Ghose and Han 2014). Usually, these guidelines are familiar to consumers through experience. The marking of the age restriction therefore can lead to a certain idea of the game content and gameplay mechanics. Based on the categorization theory, the age restriction should have a direct influence on this categorization process, which would influence the choice intention.

### **3.1.3 Empirical Study: Method and Procedure**

To examine the impact of these attributes on the choice, we designed a choice-based conjoint experiment. In general, this is an empirical approach to assess product utility, generated by different attributes, which results in a concrete choice. The choice-based approach is by far the most preferred model of conjoint analysis, mainly because it reflects to a high degree the real-life choice behaviour of consumers (Currim and Sarin 1984). Usually, the participants are confronted with different product variations and asked which option they would

most likely prefer to buy or use. Each product has a certain number of attributes with different levels. Attribute levels are defined as any value the attribute can take (e.g., different price levels for the attribute price). It is also possible for the respondents to choose neither of the presented options. Based on these levels and corresponding attributes, through which the stated product is described, it is possible to calculate the utility that each attribute level contributes to the overall utility of the product. Research has shown that choosing a preferred product in a choice based conjoint experiment is similar to what consumers actually do in different marketplaces. Choosing a preferred product from a group of products is a simple and natural task that everyone can understand (Arora and Huber 2001; Oppewal et al. 1994; Roberts 2000). In the context of mobile gaming apps, we designed a choice-based conjoint experiment with a variety of different mobile games. This enabled us to analyze the possible impact as well as the utility that certain attributes of mobile gaming apps might have on the choice.

To develop a research design two steps needed to be taken. First, the significant relevant attributes for the choice must be determined. We explained by the categorization theory above the attributes that might affect the choice in the context of mobile gaming apps, namely the icon, genre, price, revenue model, reviews and age restriction. In order to determine the exact selection, we conducted a preliminary study to identify attributes of mobile gaming apps that should have a significant influence on market success. We argue that if those attributes really affect the choice, the relationship should be detectable through the number of downloads that a mobile gaming app has generated in the app stores. Secondly, the different levels of the significant attributes needed to be defined. This second step should usually be affected by real market characteristics (Sawtooth 2013). Therefore, in the context of our study, we only considered attribute levels that are common and displayed in the app store.

#### *Preliminary Study: Attribute and Level Selection*

We used the range of downloads provided in the Google Play Store through a stated download category as our dependent variable. We conducted an ordinal regression analysis with these category labels as our dependent variable to determine the significant attributes for the choice-based conjoint experiment. Thus, we collected data from 300 different mobile gaming apps from the top charts in the United States in January 2017. Furthermore, the discussed attributes were also recorded from the app store as our independent variables. For this study, the app store offers all needed information publicly. Therefore, all information's could be recorded completely. A data cleansing procedure was not necessary. In this ordinal regression two additional control variables were included. The first was

the number of days since the release date of the app. We assume that a mobile gaming app that was available for a longer period of time also generated more downloads. Furthermore, the number of published titles by the same developer was also recorded and taken into account for the given procedure. This number was included because developers with a larger portfolio of apps usually are more experienced and successful. In addition, those developers use the possibility to advertise the new mobile gaming app through previously released apps (Lee and Raghu 2014).

The results are illustrated in Table 3.1. First, we calculated a threshold value for each rank of the dependent variable that a mobile gaming app has to achieve to be assigned to a given rank. Except for the first rank, all threshold values proved to be significant at  $p < .05$ . The odds ratios on the independent variables indicate the probability that an app gets upgraded to a higher rank. For the assignment of a given app to any rank, the calculated odds ratios of the independent variables have to be added. If this sum exceeds the threshold of a rank from the dependent variable, the app gets assigned to the next-highest rank.

Through this process, 51% of the apps in this sample are assigned correctly. Given an error tolerance of just one rank, it was even possible to assign 77% of the included apps. To be able to measure the effect of the icon, we categorized the icons according to their illustrated content based on the findings of Clement (2007). Each icon was coded according to whether a human, animal, object or abstract symbol was represented (coded with 1 when the icon belongs to that group or 0 otherwise). Because each icon is exactly assigned to one group, the odds ratio values indicate the difference between the base variable (here ABSTRACT). Thus, for example, the odds ratio drops by 1.106 points when a human being has been illustrated. The impact of all these odds ratio values within the icon attribute were significant at  $p < .10$ . All three odds ratio values are negative, which indicates that on average icons with an abstract illustration are the most successful group. The genre attribute was also marked with a dummy variable. However, only seven of the 18 possible game genres were recorded, since the other categories were not sufficiently represented in the sample (fewer than 10 mobile gaming apps).

Therefore, the apps from those categories were labeled as OTHERS, which also constituted the base variable for this attribute. The genres ACTION, ARCADE, PUZZLE and CASUAL also have a significantly positive influence on the dependent variable with at least  $p < .1$ . Since the mobile gaming apps from our sample were taken from the top lists of free games and paid games, the next attribute signals whether the game was available for free (=1) or not (=0). The impact of this attribute is highly significant ( $p < .01$ ) and shows a particularly

**Table 3.1** Ordinal regression estimation results

Attribute	Label	odds ratio	std. error	p-value	Operationalization
Range of Downloads*	1000–5.000	3.619	1.917	.059	Vector of 10 categorizations of the range of downloads
	5.000–10.000	4.331	1.915	.024	
	10.000–50.000	6.020	1.928	.002	
	50.000–100.000	6.948	1.941	.000	
	100.000–500.000	9.678	1.996	.000	
	500.000–1 million	10.621	2.012	.000	
	1 million–5 million	13.189	2.069	.000	
	5 million–10 million	14.131	2.087	.000	
	10 million–50 million	17.066	2.140	.000	
Icon*	50 million–100 million	19.477	2.210	.000	(Each icon was set to 1 if appropriate or 0 otherwise)
	HUMAN	–1.106	.333	.001	
	ANIMAL	–.606	.351	.084	
	OBJECT	–.929	.329	.005	
Genre*	ABSTRACT	0			(Each genre was set to 1 if appropriate or 0 otherwise)
	ACTION	.904	.407	.026	
	ADVENTURE	.119	.408	.770	
	ARCADE	.855	.434	.049	
	SIMULATION	–.030	.401	.940	
	CASUAL	.917	.550	.095	
	PUZZLE	1.312	.478	.006	
	STRATEGY	.622	.477	.192	
Revenue*	OTHERS	0			(Free = 1, 0 otherwise)
	FREE	6.029	.537	.000	
	PRICE	–.150	.082	.067	
	INAPP	–.544	.314	.083	(With in-app purchases = 1, 0 otherwise)

(continued)

**Table 3.1** (continued)

Attribute	Label	odds ratio	std. error	p-value	Operationalization
Reviews*	RATING	.968	.417	.020	Number of stars in the rating system
	REVIEWS	.001	.000	.000	Total number of reviews
Age restriction*	AGE	.014	.023	.526	Appropriate age
Days since release**	DAYS	.004	.000	.000	Total number of days since release
Publisher portfolio**	PORTFOLIO	.009	.003	.006	Total number of published apps

Note: R-Square: 85.3 \* Data source: [play.google.com/Store](https://play.google.com/Store) \*\* Data source: <https://sensors tower.com>

high odds ratio value. If the mobile gaming app was available for free, the number of downloads in our sample increased dramatically. The price showed a significant negative impact on the number of downloads. This effect can be explained by the increased buying risk for the consumers with rising prices. The attribute “average rating” also shows a significant impact ( $p < .05$ ) with a relatively high positive value for the odds ratio. The influence of the number of reviews also proved to be highly significant. However, the direction of the influence cannot be determined exactly in this analysis. It is more likely that this connection is a result of the fact that more people have downloaded very successful games and the chance that a review will be released also increases. A negative impact of the in-app purchases was also significant ( $p < .1$ ). If a title contains such a function, this mobile gaming app is encoded with a “1” during the data acquisition. Therefore, such integration in the mobile gaming results in a deterrent effect for the consumers. The age restriction did not show a significant impact. This attribute was measured on a metric scale with the suitable age. In addition, both control attributes were found to be significant ( $p < .01$ ). So, a game available for a longer period of time generates a higher number of downloads, and a developer who has published a large number of apps usually generates more downloads with a new-release mobile gaming app. Based on the findings of this preliminary study the significant attributes icon, genre, price, average rating, number of reviews and in-app purchases were included in the choice-based conjoint analysis. To define the levels of the identified attributes, we proceeded as follows. We defined nine choice

tasks for the participants with four randomly generated product variations (Sawtooth 2013). Therefore, each subject had to evaluate exactly 36 product variations (four products \* nine choice tasks). For a choice-based conjoint experiment, it is important that the number of levels for an attribute is divisible by the number of variations, here 36. Otherwise, a single level of an attribute would be displayed to a subject more frequently than the remaining levels. This would lead to a later distortion of the estimated utility values (Sawtooth 2013).

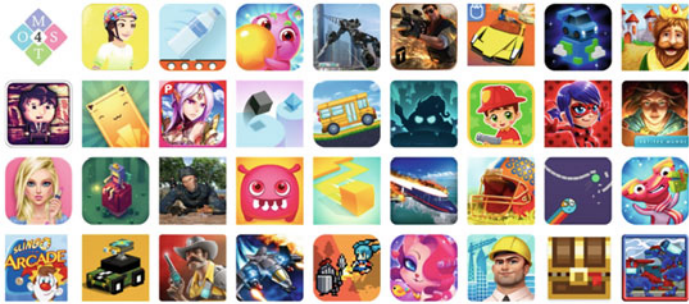
Usually, only one icon is assigned to a specific mobile gaming app. Even a sequel to a well-known mobile gaming app will be given its own unique icon. In order to transfer this phenomenon to the choice-based conjoint experiment, we copied 36 icons from just-released apps. Therefore, we only include icons in our experiment that were unknown to the participants, to rule out any possible influence of former experience of participants. When selecting the levels for the attribute genre, we included all possible 18 game genres from the app stores. When defining possible prices, the free category was also included, seeing that the influence of this option was theoretically proven in the preliminary study. The lowest price that can be set in the app store by a developer is \$0.99. The highest price within the data of the preliminary study was \$4.99 for the paid version of a mobile gaming app. The price of \$2.99 was included as an intermediate stage.

Furthermore, we displayed whether or not in-app purchases or advertisements were integrated. These two functions correspond to the typical revenue models that occur in the app store. In order to enable a clear distinction between a negative, average and positive rating, this category was divided into three levels, namely 1 Star, 3 Stars and 5 Stars. Before the number of reviews is even displayed in the app store, at least five reviews for a given app have to be given by its consumers. Therefore, this number was included as a minimum for this attribute. In the preliminary study, some mobile gaming apps had over 30,000 reviews. Based on this data, the number 32,805 was recorded as a maximum. In order to create a realistic approach for the experiment we used some odd numbers as intermediates. Table 3.2 provides an overview of the final research design. The participants of our choice-based conjoint experiment were recruited in Germany. They were informed that they were needed for a study on the subject “Mobile gaming apps” via e-mails and postings on online social networking sites and they had to own a mobile device.

Furthermore, they had to install at least one mobile gaming app on their personal device in order to join the experiment. Otherwise, there were no restrictions on participation. Overall, the answers of  $N = 503$  participants (women: 49.7%, Mage = 29 years, SD = 11.2) were fully completed and could be used. 58.6% of the participants were students and 35.0% were employed. Every participant in

our study stated they owned at least one mobile device (e.g., a tablet computer or a smartphone) offering the functionality to access an app store as well as to download and use mobile apps. The average number of mobile gaming apps the participants had installed on their mobile devices was  $M = 6.8$  ( $SD = 10.7$ ).

**Table 3.2** Attributes and Levels included in the Conjoint Experiment

Attribute	Level
Icon	
Genre	Action, Adventure, Arcade, Board, Card, Casino, Casual, Educational, Family, Music, Puzzle, Racing, Role Playing, Simulation, Sports, Strategy, Trivia, Word
Price	Free, \$0.99, \$2.99, \$4.99 None, With in-app purchases, With advertisements, With in-app purchases and with advertisements
Reviews	1 Star, 3 Stars, 5 Stars 5 reviews, 16 reviews, 45 reviews, 132 reviews, 405 reviews, 1273 reviews, 3689 reviews, 10,935 reviews, 32,805 reviews




### 3.1.4 Results

To compute the utility for each level and attribute we estimated individual-level partworth utility from the conjoint results through a Hierarchical Bayes routine (Arora and Huber 2001). We used 20,000 iterations to generate parameter estimates for the utility of the levels for each participant. An example of that calculation is given in Table 3.3. Through the Hierarchical Bayes routine, the utility values were determined on a scale of  $-100$  to  $100$  and could be added to each other across the attributes. Therefore, this method calculates a total utility for each product variation within the experiment. All calculated values were significant at  $p < .01$ . Based on total utility the participants should choose the variation with the highest overall utility. These predicted decisions were compared with



the actual choice decisions of the participants. This process generated a hit rate of 85% correct predictions.

**Table 3.3** Example of the Calculation of a Choice Task

	<i>First Option</i>	<i>Utility</i>	<i>Second Option</i>	<i>Utility</i>	<i>Third Option</i>	<i>Utility</i>	<i>Fourth Option</i>	<i>Utility</i>
<i>Icon</i>		21.78		-21.43		36.18		-22.51
<i>Genre</i>	Family	-12.95	Casual	4.85	Word	24.83	Action	-19.76
<i>Price</i>	\$ 2.99	-26.09	Free	60.11	\$ 0.99	1.85	\$ 4.99	-35.88
<i>In-App Purchases</i>	None	27.86	With in-app purchases	-2.94	With advertisement	-10.78	None	27.86
<i>Average Rating</i>	1 Star	-48.48	5 Stars	42.70	3 Stars	5.79	1 Star	-48.47
<i>Number of Reviews</i>	5	-15.71	10.935	8.47	132	-2.17	405	-1.15
<i>Sum of the Utility</i>		-53.59		91.76		55.70		-99.92
<i>Predicted Choice</i>								

*Effects of the Icons on Consumers' Choice for Mobile Gaming Apps*

Based on the results of Barsalou (1992), the visual appearance of a product is a key attribute of the cognitive category assignment with regard to the categorization theory by Cohen and Basu (1987) and therefore should have a large impact on the overall utility of a mobile gaming app. The calculated utilities (Table 3.4) values show a wide range between the perceived lowest and highest value for a given icon within the choice-based conjoint experiment. With regard to our research design, we are not able to make a statement about the utility values of an icon for a single participant, since every participant has seen an icon only once. However, the displayed product variations were randomly assigned for each participant, high utility values for certain icons still appear for the entire sample. In order for an icon to be assigned with a high utility value at all, a corresponding number of subjects have to prefer a certain icon independently. Moreover, there is no empirical evidence for a distortion effect within the data, by the variety of

the used icons. Thus, these results are consistent with previous research (Steinmann et al., 2016; Underwood et al. 2001). Interestingly the three icons with the highest utility value have rather abstract forms. Therefore, these outcomes are similar to the results of the preliminary study. Apart from these results, patterns are not recognizable in the order of the icons and the associated utility values. Illustrated people, animals and objects are likewise partially preferred or rejected by the participants.

**Table 3.4** Average Utility of the Icons

Level									
Utility	-57.90	-39.11	-38.72	-38.15	-36.38	-30.64	-23.76	-22.51	-22.37
Level									
Utility	-21.43	-14.18	-13.09	-12.51	-9.95	-8.70	-7.56	-6.68	-5.01
Level									
Utility	1.16	2.57	3.28	5.76	7.52	10.08	13.61	16.62	21.78
Level									
Utility	22.88	23.86	35.80	35.96	36.18	36.49	38.58	46.32	49.96

### *Effects of the Genres on Consumers' Choice for Mobile Gaming Apps*

The importance of the attribute genre can also be confirmed in this experiment, similarly to in previous studies (Austin and Gordon 1987; Elberse and Eliashberg 1993). The participants differentiated very strongly in the displayed levels of the attribute genre. As illustrated in Table 3.5, the genre Casino has the lowest utility value.

Strategy, Word and Trivia, on the other hand, showed very positive utility values. It seems that games which require a certain amount of cognitive effort and logic stimulate positively the overall utility of mobile gaming apps to a large extent. Interestingly, very traditional game genres like action, racing and sport tend to generate a negative utility value. These findings indicate that these genres are less suitable for the mobile gaming market and might be more appropriate for other devices like consoles or computers. Based on the results, the genres music,

**Table 3.5** Average Utility of the Genre

<i>Level</i>	Casino	Racing	Action	Sports	Family	Educational
<i>Utility</i>	-62.12	-23.24	-19.76	-18.22	-12.95	-6.65
<i>Level</i>	Music	Adventure	Role Playing	Card	Casual	Arcade
<i>Utility</i>	-0.14	0.14	2.21	3.23	4.85	5.09
<i>Level</i>	Puzzle	Simulation	Board	Word	Trivia	Strategy
<i>Utility</i>	5.20	8.55	9.27	24.83	32.24	37.28

adventure and role playing are largely indifferent. With regard to the utility values neither an aversion nor a preference can be seen here.

#### *Effects of the Price and Revenue Model on Consumers' Choice for Mobile Gaming Apps*

The results in Table 3.6 display a strong preference for mobile gaming apps that are available for free. Interestingly, a price of \$0.99 still shows a small positive utility value. A strong aversion emerges only through an increase to \$2.99 and beyond. However, the deterioration in the utility is continuously decreasing within this attribute. These results are similar to the findings of Shampanier (2007) and to our preliminary study.

**Table 3.6** Average Utility of the Price

<i>Level</i>	Free	\$ 0.99	\$ 2.99	\$ 4.99
<i>Utility</i>	60.11	1.85	-26.09	-35.99
<i>Level</i>	With in-app purchases and with advertisements	With advertisements	With in-app purchases	None
<i>Utility</i>	-14.14	10.78	-2.94	27.86

There is a strong positive effect of a free price on the stated choice by the participants. The findings reported by Kempf (1999) or Cheng and Liu (2012) also seem to apply to mobile gaming apps. Furthermore, the integration of in-app purchases and advertisements also generate negative utility values. On the one hand, the difference between a free title and a price of \$0.99 is 58.26 units within the range of the utility values. On the other hand, the perceived overall benefit of in-app purchases only drops by 30.8 units with such integrated features. Overall, it is advisable to integrate in-app purchases because the overall utility

is significantly higher than for a similar paid version of the mobile gaming app. Furthermore, our analysis shows that integrated advertisement revenues are perceived as more disruptive than in-app purchases, with regard to the lower utility value. Thus, this revenue model is also not recommended.

#### *Effects of the Reviews on Consumers' Choice for Mobile Gaming Apps*

In evaluating the utility values in Table 3.7, a negative rating marked by 1 Star results in a high negative utility value and therefore an aversion to the mobile gaming app. A minimum of 3 Stars is required so that the attribute average rating is not perceived as upsetting. However, a 5 Star rating increases the utility value dramatically. To be more specific the increase between 3 Stars and 5 Stars is 36.91 units of the overall utility. For example, this effect could compensate the negative influence that arises through the embedding of in-app purchases. Similarly, a price increase from \$0.99 to \$4.99 could also be compensating in the overall utility of a mobile gaming app based on the previous results. Interestingly, the perceived total benefit hardly changes when the number of reviews increases.

**Table 3.7** Average Utility of the Average Rating and the Number of Reviews

<i>Level</i>	1 Star	3 Stars	5 Stars
<i>Utility</i>	-48.48	5.79	42.70
<i>Level</i>	5 reviews	16 reviews	45 reviews
<i>Utility</i>	-15.71	-7.15	-2.50
<i>Level</i>	132 reviews	405 reviews	1273 reviews
<i>Utility</i>	-2.17	-1.15	0.32
<i>Level</i>	3689 reviews	10935 reviews	32805 reviews
<i>Utility</i>	3.56	8.47	16.34

Table 3.7 shows that the range between the most negative and the most positive utility value is relatively small. Therefore, the average ratings of only a few consumers or a large number of consumers are hardly differentiated. However, a significant impact can be observed similar to the basic findings of Chen et al. (2004), but the influence of the average rating is far more critical in influencing the overall utility of a mobile gaming app. Overall, a badly designed icon, the genre Casino, a high price and a poor average rating are perceived as clear trade-offs for the choice behaviour. Furthermore, the integration of in-app purchases and the number of reviews only have a marginal influence on the choice behaviour. As shown, the range of the utility values between the levels differs from one attribute to another. A high range indicates that consumers clearly

differentiate between the levels of an attribute and therefore this attribute gets perceived as very important, in contrast to a small range between the levels. Based on the findings of this experiment the worst utility value a mobile gaming app could have is  $-234.23$  units, due to the addition of the most negative utility values across the different attributes. However, the highest utility value a mobile gaming app could get is  $235.24$  units, due to the addition of the highest utility values. From the maximum possible range of  $469.48$  units, the icon could explain  $107.86$  units, which represents  $23.02\%$  of the average importance. According to this method, the average importance of the other attributes can also be determined: genre ( $21.22\%$ ), price ( $20.49\%$ ), revenue model ( $8.07\%$ ), average rating ( $19.46\%$ ) and the number of reviews ( $6.84\%$ ).

### 3.1.5 Conclusion and Limitations

Starting from the basic assumptions of the categorization theory according to Cohen and Basu (1987), we first defined attributes that consumers perceive in the app store and have an impact on the preference or aversion of the consumer. In order to demonstrate the actual impact, we carried out a preliminary study, which was used to determine the influence of these attributes on the number of downloads through a market analysis. Based on the significant results, we conducted with these attributes a choice-based conjoint experiment to calculate the utilities of the attribute levels as well as the average importance of the attributes themselves. Thus, we were able to define attributes that are interchangeable.

The results from the choice-based conjoint experiment indicate that the icon, genre and price are the most important attributes for the consumer. Barsalou (1992) already confirmed that the visual appearance is one of the most important features of the categorization process according to the categorization theory by Cohen and Basu (1987). We could confirm this statement based on the calculated average importance of the icon. Furthermore, the high importance of the genre was also addressed in previous studies (Austin and Gordon 1987; Elberse and Eliashberg 2003; Desai and Basuroy 2005). In the context of mobile gaming apps, the genre seems to be particularly important for the consumer, due to the fact that certain genres are associated with specific game mechanics and principles. Similar to the findings of Liu (2012), our results also indicate a high importance of the attribute price. In principle, it is not recommended for a developer to state a fixed price at all. The mobile gaming app should rather be available for free with integrated in-app purchases. However, it is important to keep in mind that not all consumers are willing to purchase such features. Therefore, the conversion rate of

the specific mobile gaming app has to be taken into account. Furthermore, reviews (which can hardly be influenced by the developer) play a slightly insignificant role, as long as the game gets an average positive rating average from other consumers.

The findings of our study might not only be of interest in the context of mobile gaming apps, but also for video games and hedonic products in general. Whenever such products are placed next to each other in an online environment, a consumer makes a choice decision based on the displayed product attributes. We assume that the most important attributes like the visual appearance, the price and average ratings are similarly weighted in such choice situations. However, app developers, publishers and app-store providers can consider the findings of our study to better attract consumers of mobile gaming apps. Our results indicate that the icon of a mobile gaming app is a very important attribute to increase the perceived utility. This is particularly interesting, as an icon can be completely designed by the developer without restrictions from the app store. In addition, a developer must be aware that there are certain genres that are very popular or even unpopular. The choice to develop a game in a particular genre could have an immediate effect on the price or the revenue model in order to possibly compensate a negative perceived utility value. Furthermore, it is equally important to take feedback from other consumers seriously. If errors are reported through the reviews, they should be eliminated as soon as possible, in the hope that this will lead to a more positive rating of the game and thus potentially attract new consumers. Developers can also use those results for their own advertisement. It may be useful to address, in particular, the genre, the price or the average rating in the communication activities in order to attract new consumers. Furthermore, for developers, the results are very useful because they allow calculation of the overall perceived utility of a developer's own mobile gaming app as well as the overall utility of mobile gaming apps provided by the competition. Since the app store has different lists (e.g., charts-list, new released-list and noteworthy-list), it is advisable to determine such utilities of mobile gaming apps displayed next to each other to update the icon design or the price, in order to attract more potential consumers within the market environment.

The results have important implications for future research on the importance of attributes in consumer choice of a mobile gaming app, which are also related to the limitations of the present study. The importance of the icon as a success driver for mobile gaming apps has been neglected in previous research so far. Therefore, this article contributes to the marketing literature by providing empirical evidence on how nonverbal elements (such as an icon) can contribute to

consumers' choice intention. Further research should always consider the influence of the visual representation of products (not only for mobile gaming apps, but for digital products in general). In particular, in the context of hedonic goods, screenshots, trailers, and clips certainly play an important role in reducing the perceived purchase risk from consumer's point of view. Research in color psychology already confirms the importance of colors as a visual differentiator. As a marketing tool, color could attract consumers and shape their perceptions. Through colors, a brand can establish an effective visual identity and position itself in the marketplace relative to its competitors (Bellizzi et al. 1983; Gorn et al. 1997). These effects should be considered more frequently in marketing research. Nevertheless, this research also has several limitations. First, our findings are only valid for the game category in the app store. We are not able to make any statements regarding the impact of those attributes in completely different product categories, like business or education apps, which are mainly used for utilitarian purposes. In addition, we could not state any influence of possible interaction effect. It is possible that for example a paid mobile gaming app with integrated advertisements generates a particularly high aversion among consumers. Furthermore, two attributes could not be included in this choice-based conjoint experiment, due to their diversification, namely screenshots and description texts. Screenshots of the mobile gaming app also give a visual impression of the game mechanics and principles. Due to the variety of design possibilities, such an impact has to be addressed by further research. Furthermore, mobile gaming apps are also presented with a description text. This is also an attribute that certainly leaves the consumer with an impression about the game mechanics. In addition, we did not take into account the possibly moderating effect of the variable's attitudes and involvement. There are some experienced consumer groups who specifically searching for certain types of mobile gaming apps. Therefore, the perceived importance from the product attribute might shift between different consumer groups. Such effects should be investigated in further research. Moreover, this study was conducted among consumers in Germany. Prior research in personality and consumer behaviour shows several important differences in personalities with respect to demographic variables (e.g., age, culture and education) and differences in general online behaviour between countries. In follow-up research, this and the previously mentioned issues should be addressed.

## **3.2 The Role of Colour Contrast and Predominant Primary Colour of Icons for Mobile Gaming Apps in Influencing Consumer Reactions**

### **3.2.1 Introduction**

In line with consumers' adoption of mobile devices such as tablet computers or smartphones, a huge market of applications (apps) for mobile devices has evolved. Overall, in 2021 more than 140 billion apps with a sales volume of more than \$28. One of the most important categories of apps within this market are mobile games. For example, mobile games have accounted for 21% of the mobile content market and is envisaged to retain its dominating hold over the market due to the availability of low-cost smartphones and tablets with high-end specifications (Statista, 2021c). Given this enormous potential and the expected growth of the market for mobile gaming apps the questions arise, how should mobile gaming apps be designed, and which factors will trigger their success in the market. If a consumer visits an app store it is likely that one of the first elements of a mobile app that will get her/his visual attention will be the icon that pictorially represents the app. Such icons are designed by the game developer or the publisher with the aim to attract the focus of attention of the consumer when visiting, e.g., an app store. Hence, the icon of a mobile gaming app might fulfill similar functions as product packaging. Research has shown that packaging has an impact on visual attention towards products and also influence purchase decisions (Folkes and Matta 2004, Underwood et al. 2001). In this context, one of the most important design elements of product packaging that impacts product expectations and evaluations is its colour (e.g., Hine 1997). Colours have a significant impact on e.g., advertising effectiveness, the perception and evaluation of brand personality, the experienced emotions, visual attention, as well as purchase intention (Gorn et al. 1997; Valdez and Mehrabian 1994). In the context of online consumer behaviour, the findings of Lothia et al. (2003) show that colour used in banner advertisements influences click-through-rates. The results of Nitse et al. (2004) imply that the colours used in online product presentations elicit specific expectations towards the presented products and if an online shop provider fails to meet these expectations, this will negatively influence consumers' satisfaction as well as purchase behaviour. Moreover, Bellizzi and Hite (1992) as well as Lichtlé (2007) have shown that colour attracts consumers due to certain perceptual qualities, which influence, e.g., attitude towards a product. In this context, colours are often related to the perception and the evaluation of the esthetic appeal of a product, a web site or an attitude object in general and



might trigger consumers' cognitive processes towards a presented object, e.g., in an online shop (Bonnardel et al. 2011; Coursaris and van Osch 2016; Deng et al. 2010). The aforementioned studies as well as research in the field of consumer psychology have mainly focused on the influence of specific colour dimensions (hue, saturation, and lightness) on consumer responses. For example, with regard to the hue dimension, red was found to elicit a higher level of arousal compared to blue; interestingly, if products were presented in front of a blue-coloured background they will be evaluated more positive than products presented in front of red-coloured backgrounds (Bellizzi and Hite 1992) and red-coloured background (compared to blue-coloured backgrounds) increase consumers' willingness-to-pay as well as elicit higher bid jumps in online auctions (Bagchi and Cheema 2013). Gorn et al. (1997) found that a higher level of lightness led to relaxation, whereas a higher level of saturation led to excitement. Moreover, the background colour of a web page influences perceived download quickness and has further consequences for consumer's evaluations of the web site (Gorn et al. 2004). Based on these previously mentioned findings, we assume that the colour information contained in an icon of a mobile gaming app will influence the consumers' perceptions and evaluations and will also have an impact on the intention to download the mobile gaming app.

All of the previous mentioned studies focused on single colours or on single colour dimensions, not colour combinations, and thus did not consider the relationships between colours. However, most visual stimuli that consumers observe are rarely unicoloured. Consequently, there is a lack of research that investigates the impact of colour combinations and the resulting contrast (e.g., analogous or complementary) on consumer responses. Only a few studies have analyzed the impact of colour combinations or colour contrast on consumer responses (e.g., Noiwan and Norcio 2006). Deng et al. (2010) studied the impact of colour combinations on consumers of the NIKEiD online shoe configurator. Their findings imply that most consumers prefer combinations of colours that either matched or were closely related to each other (i.e., combinations of similar colours), but some consumers chose a contrastive colour to highlight some components of the shoe. Overall, the majority of the few existing studies have shown that consumers tend to prefer a combination of similar colours (resulting in an analogous contrast), because such combinations are perceived as more congruent, more harmonious and esthetically appealing compared to combinations that are more incongruent and result in a complementary contrast (e.g., Schloss and Palmer 2011). In this context, based on the basic assumptions of congruence (congruity) theory (Osgood and Tannenbaum 1955), research agrees that congruent stimuli, e.g., combinations of specific elements within advertisements or combinations of

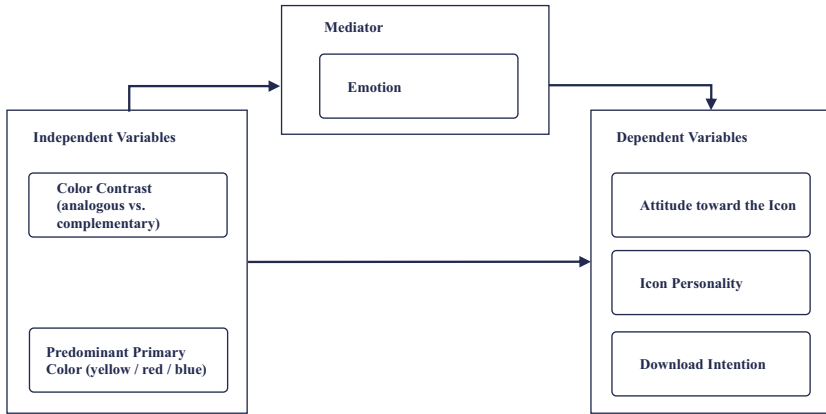
similar colours, should cause a more positive perception and evaluation of an object than incongruent stimuli (Till and Busler 2000). In the context of online consumer behaviour, van Rompay et al. (2010) have investigated the impact of picture-text congruity on the evaluation of an online hotel booking site. The findings of this study show that picture-text congruence has a positive impact on the attitude towards a product due to an increase in the consumer's processing fluency of the presented information. Furthermore, the findings of Moore et al. (2005) imply that congruity between banner advertising and web site context positively influence consumers' attitudes towards the advertising and that this effect is further influenced by banner colour as well as banner colour-text colour contrast. With regard to the previous discussion, we propose that an analogous colour contrast—combinations of similar, congruent colours—in an icon of a mobile gaming app will result in a more positive perceptions and evaluations of the related game and will further have a positive impact on, e.g., the consumers' experienced emotion, attitude, as well as download intention. With regard to the influence of colour on consumer behaviour in general, we investigate the impact of the predominating primary colour of an icon of a mobile gaming app on the consumer responses under study. Hence, the present study contributes to knowledge in the field of human behaviour in IS, especially in the context of mobile gaming apps in numerous ways: We transfer the framework for the investigation of the mediating impact of experienced emotions on consumer-related outcome variables proposed by Holbrook and Batra (1987) to the context of icons for mobile gaming apps and systematically manipulate the predictor variables icon colour contrast (in terms of a complementary contrast vs. an analogous contrast) and the predominating primary icon colour (in terms of primary colours yellow vs. red vs. blue) in an online experiment. More precisely, we expand the findings of previous studies in the field of human behaviour and IS by investigating 1) how icon colour contrast influences consumers' experienced emotions, their attitude towards the icon, the icon's personality, and download intention and 2) how the predominating primary colour of the icon influences these consumer-related outcome variables. Based on Holbrook and Batra (1987), we 3) analyze the mediating impact of emotion on the relationship between icon colour contrast and icon colour on attitude, personality perceptions, and download intention.

### **3.2.2 Theoretical Background and Hypotheses Development**

With our study we address the impact of icon colour contrast and the moderating impact of the predominating primary icon colour of mobile gaming apps on

several consumer-related outcome variables, namely, emotion, attitude towards the app, brand/game personality perceptions, and download intention. We transfer and expand the framework for assessing the role of emotions as mediators of consumer responses from the field of research on advertising effectiveness proposed by Holbrook and Batra (1987) to the context of mobile gaming apps. In the context of innovation and new product development, Noble and Kumar (2010) also suggested to study the mediating impact of emotional value between different design levers of a product (e.g., visual esthetics, colour, graphics) and consumer responses. Moreover, by transferring the basic assumptions of congruence (congruity) theory (Osgood and Tannenbaum 1955) to the context of our study, we assume that individuals positively value harmony of combinations of objects in general or of specific elements of an object (e.g., within an advertisement) and this, in turn, should positively influence experienced emotion, attitude, personality perceptions, and download intention. For example, Shen and Chen (2007) showed that a high degree of congruence between a banner advertisement and the content of a website will result in more favorable attitudes towards the advertisement as opposed to banners incongruent with the website. The assumption that congruence between different objects as well as between the elements within an object will have a positive impact on consumer responses is also supported by the “match up” hypothesis (Kamis 1990; Till and Busler 2000). This hypothesis implies that combinations of elements within an attitude object (e.g., an advertisement or an icon of a mobile gaming app) are more effective when there is a high degree of fit or congruence between the single elements. We therefore propose that an analogous colour contrast in an icon of a mobile gaming app should be perceived as more congruent as well as harmonious and hence, lead to a more positive evaluation of the icon, compared to icons with complementary colour contrasts. This implies that combinations of similar colours or an analogous colour contrast in an icon of a mobile gaming app will trigger a more positive perception and evaluation of the icon, compared to combinations of dissimilar colours, which produce a complementary contrast. Icon colour contrast and the predominant primary icon colour act as the independent variable in our framework. In our experimental study icon colour contrast is manipulated by different colour combinations in an icon of a mobile gaming app (complementary contrast vs. analogous contrast). According to Itten (1973), an analogous colour contrast is defined as a group of related or similar colours that are close to each other on the colour wheel, and a complementary contrast is understood as a combination of colours opposed to the other member of the pair on the colour wheel, e.g., as green opposed to red or orange opposed to blue. Moreover, the findings of Moore et al. (2005) imply that the impact of colour contrast on consumer-related

outcome variables should further be influenced by the colours that create the contrast within an attitude object. This assumption is based on previous research on the impact of colour on consumer evaluations and their behaviour. The proposed research model is presented in Figure 3.2.



**Figure 3.2** Research Model

Studies in that field have shown that consumers associate different colours with different meanings and hence, different colours should cause different effects on consumer evaluations of an attitude object, not only in online environments (Moore et al. 2005; Noiwan and Norcio 2006). To test the proposed impact of the icon colour, we investigate the impact of the predominating primary colour (yellow vs. red vs. blue) within an icon of a mobile gaming app on the consumer-related outcome variables in the research model by manipulating the predominant primary icon colour in the stimuli used in the online experiment respectively. In the context of our study, a colour is defined as predominant if it exceeds a critical threshold of 50% on average in relation to the total number of pixels of the icon ( $300 \times 300$  pixels). We measured this threshold via the software Adobe Photoshop. According to Holbrook and Batra (1987) the impact of icon colour contrast on attitude formation and the further outcome variables should be mediated by emotional responses of the consumer. In the following, a discussion of the constructs under investigation is presented and hypotheses are derived, explained and tested in an online experiment.

*Impact of Icon Colour Contrast and Icon Colour on Emotion*

Research in the field of human behaviour and IS have shown that a consumer's experienced emotions when interacting with a stimulus in an online environment has an influence on evaluation processes and also impacts satisfaction with the product (Sautter et al. 2004; Thüring and Mahlke 2007; Zhou et al. 2007). For example, the findings of Garrett (2003) and Rosen and Purinton (2004) have shown that the visual design of a website, which is—beside others—expressed through colours, will have an impact on the consumer's emotional responses. In this context, appraisal theory suggests that individuals first cognitively appraise situations causing the formation of emotions (Lazarus 1984). Cognitive appraisal is based on the evaluation of a specific situation or a specific object and is further influenced by the degree of congruity of different elements within the stimulus. For example, Éthier et al. (2008) have shown that design features of a web interface will have an effect on the cognitive appraisal of a consumer and this, in turn, will influence the consumer's experienced emotions when interacting with the website. In the context of our study, the cognitive process triggered by the extent of colour congruity, which results in different colour contrasts, reflects the cognitive appraisal. If similar colours are combined and match, thus resulting in an analogous contrast of an icon of a mobile gaming app, this should lead to more positive emotional experiences, compared to a complementary contrast. In line with previous research on the impact of colour on consumer behaviour, Gorn et al. (1997) as well as Ou et al. (2004) provide empirical evidence for the impact of colours on consumer emotional responses and their findings indicate that colour combinations also affect emotions. Analogous colour contrasts should in general be perceived and evaluated as more harmonious and pleasing from the consumer perspective compared to complementary contrasts and therefore, should lead to more positive emotional responses (Palmer and Griscorn 2013; Schloss and Palmer 2011).

We thus assume that an analogous colour contrast in an icon of a mobile gaming app has a positive impact on the consumers' experienced emotions while being exposed to the icon. Moreover, the findings of previous research in the field of consumer behaviour indicate an impact of colours on the consumer's experienced emotions when being exposed to an icon of a mobile gaming app in an online environment. Based on the Pleasure-Arousal-Dominance (PAD) emotion model (Mehrabian and Russel 1974), Valdez and Mehrabian (1994) have shown that in general colour and its attributes have an influence on all PAD-dimensions but will cause different effects. For example, the primary colour blue is perceived as more pleasant compared to the primary colour yellow, but yellow will positively impact arousal and is also associated with a stronger effect on the

dominance dimension. Furthermore, different colours are associated with different meanings from the perspective of consumers and influence their perceptions and evaluations of products, advertisements or websites in different ways (Cyr et al. 2009; Gorn et al. 1997; Labrecque and Milne 2012). Hence, beside the impact of the icon colour contrast, we further propose that predominating primary colour of an icon of a mobile gaming app has an influence on the consumers' experienced emotions when being exposed to an icon in an online environment. Based on the previous discussion, we hypothesize:

- H1a:** An analogous colour contrast (vs. a complementary contrast) in an icon of a mobile gaming app will positively (vs. negatively) affect the consumers' experienced emotions.
- H1b:** The predominant primary colour in the icon of a mobile gaming app will influence the consumers' experienced emotions.

*Impact of Icon Colour Contrast and Icon Colour on the Attitude towards the Icon*

If consumers are exposed to a product or an icon of a mobile gaming app in an online environment, the way the product stimulus is presented affects their perception as well as their evaluation, which impacts the attitude towards the product (Hassanein and Head 2007). In general, the results of Mazaheri et al. (2012) indicate that consumer perceptions of different atmospheric cues (e.g., colour and its combinations) of a website will impact attitude formation. The findings of Loken and Ward (1990) imply that a high degree of congruence between the colours in an analogous contrast will positively influence attitude formation towards a specific object.

Consumers evaluate congruent objects more favorable because they might meet their expectations as well as preferences (Bottomley and Doyle 2006; Moore et al. 2005). Furthermore, the findings of previous studies indicate that an analogous contrast in an icon of a mobile gaming app should be evaluated as more esthetically pleasing and result in a more favorable attitude towards the game, compared to a complementary contrast (Gorn et al. 1997; Gorn et al. 2004; Schloss and Palmer 2011). Moreover, one might conclude that the colour combinations in an icon of a mobile gaming app are likely to positively affect especially the hedonic attitudinal aspects. Moreover, Meyers-Levy and Peracchio (1995) showed that different colours used in an e.g., advertisement differ in their degree of persuasiveness on consumer evaluations of the stimulus that is presented in an advertisement, which in turn is reflected in differences regarding the consumers' attitude towards the ad and the advertised product. In the context of consumer

evaluations in online environments, the findings of Moore et al. (2005) and Noiwana and Norcio (2006) indicate similar effects of colours on consumer attitude formation. For example, the primary colour red is often associated with excitement while the primary colour blue triggers associations of competence in the minds of the consumers when being exposed to a stimulus, which should in turn be reflected in different effects on the hedonic and the utilitarian attitudinal dimensions (Labrecque and Milne 2012). Hence, we assume:

- H2a:** An analogous colour contrast (vs. a complementary contrast) in an icon of a mobile gaming app will positively (vs. negatively) affect the consumers' experienced emotions.
- H2b:** The predominant primary colour in the icon of a mobile gaming app will influence the consumers' experienced emotions.

#### *Impact of Icon Colour Contrast and Icon Colour on Icon Personality*

The findings of Labrecque and Milne (2012) show that colours have an influence on the consumers' perceptions and evaluations of the personality of an attitude object (e.g., a brand logo) and hence, the consumers' expectations towards a branded product. Colours as well as colour combinations carry an intrinsic meaning that might become central to the perception and evaluation of a brand or—in the context of the present study—with regard to the perception and evaluation of an icon of a mobile gaming app and hence, of the game itself (Bottomley and Doyle 2006). According to Aaker (1997, p. 347), brand personality is defined as “the set of human characteristics associated with a brand”. Overall, as combinations of similar colour resulting in an analogous contrast are expected to be perceived as more harmonious and therefore, will lead to more positive evaluations of a stimulus (Moore et al. 2005; Schloss and Palmer 2011), we assume that an analogous contrast will positively influence consumers' perceptions and evaluations of the game's personality.

However, the findings of Labrecque and Milne (2012) demonstrate how single colours influence consumer perceptions and evaluations, specifically the perception and evaluation of the personality of a product or a brand. Previous research on colour associations (e.g., Bellizzi and Hite 1992; Nitse et al. 2004) implies that if a consumer is exposed to a stimulus, e.g., an icon of a mobile gaming app, the referential meaning of the (predominant) colour activates relevant associations, which should have an impact on the perception and the evaluation of the icon. Thus, we hypothesize:

- H3a:** An analogous colour contrast (vs. a complementary contrast) in an icon of a mobile gaming app will positively (vs. negatively) influence icon personality.
- H3b:** The predominant primary colour in the icon of a mobile gaming app will influence icon personality.

#### *Impact of Icon Colour Contrast and Icon Colour on Download Intention*

If combinations of similar colours lead to more positive emotional responses, they positively influence the attitude towards a mobile gaming app and further have a positive impact on the perception and evaluation of the game's personality. As a consequence, this should also have an impact on purchase intention or the download intention (Labrecque and Milne 2012). Following the logic of the present study, analogous contrasts in an icon of a mobile gaming app should lead to a higher download intention. Prior research has established that colours influence the perception and evaluation of an attitude object and hence, also alter purchase intentions (Babin et al. 2003; Bellizi and Hite 1992). The findings of Lee and Rao (2010) imply that colour acts as an important influencing factor in online environments and has an impact on consumers' store choice as well as on their intention to purchase a product from a specific online shop. Furthermore, Bagchi and Cheema (2013) have shown that the background colour of a website will have an impact on the consumers' intention to purchase a product in an online environment. With regard to previous mentioned studies study, perceptions and evaluations of an icon of a mobile gaming app induced by the predominant primary colour of the icon should also have an influence on the consumers' download intention. Therefore, we assume:

- H4a:** An analogous colour contrast (vs. a complementary contrast) in an icon of a mobile gaming app will positively (vs. negatively) influence download intention.
- H4b:** The predominant primary colour in the icon of a mobile gaming app will influence download intention.

#### *Mediating Impact of Emotion*

Holbrook and Batra (1987) have investigated the mediating impact of emotion on the relationship between stimulus and response. Their findings show that emotional responses act as an important mediator on e.g., the impact of advertisements on the attitude towards the ad and/or on the attitude towards the brand. Lu et al. (2012) have investigated the effects of negative emotions on consumer



behaviour. Their findings show that experienced negative emotions are an important mediator between dissatisfaction and repurchase intention in the context of online shopping. If consumers experience positive emotions while being exposed to the icon of a mobile gaming app, this is likely to result in a positive impact on the effectiveness of the presentation of the icon or the game, e.g., the evaluation of game personality as well as the intention to download the app.

Looking at level of interactive online product presentation features, Fiore et al. (2005) found that experiential value and utilitarian value influenced consumer response variables (attitude, purchase intention). Emotional pleasure and arousal have been found to explain the linkage between store environment and consumer behaviour in online as well as offline environments (Eroglu et al. 2001; Menon and Kahn 2002). Eroglu et al. (2003) showed that pleasure and arousal linked to specific design elements in online environments positively affect consumers' attitudes and behavioural outcome variables (see also Mazaheri et al. 2012). Accordingly, Menon and Kahn (2002) found that characteristics of products and web sites significantly influence pleasure and arousal, which predict purchase behaviour. Thus, we hypothesize:

**H5:** The experienced emotions mediate the hypothesized relationships between a) the icon colour contrast and b) the predominant primary icon colour and 1) the attitude towards the icon, 2) the evaluation of the perceived icon personality, and 3) download intention.

### 3.2.3 Empirical Study: Method and Procedure

We tested our hypotheses by using a 2X3 between subject design and manipulated the factors icon colour contrast (factor 1: analogous contrast vs. complementary contrast) and predominant primary icon colour (factor 2: yellow vs. red vs. blue) of a mobile gaming app in an online experiment. We selected icons of mobile gaming apps as product stimulus because this category is currently one of the most important categories in the app market and this category is expected to grow further in the next years (eMarketer 2015). The manipulation of the icon colour contrast was based on the previously introduced definition of a complementary contrast and an analogous contrast by Itten (1973).

Furthermore, the manipulation of the second experimental factor was based on the findings of Papachristos et al. (2005), which have shown in the context of web site design that mainly primary colours could be clearly distinguished and identified from the perspective of the consumer compared to their secondary

and especially tertiary mixtures. Furthermore, their results imply that especially the predominant primary colour of a stimulus should have a strong impact on consumer responses. We selected two icons of existing mobile gaming apps (one displaying a humanoid character and one displaying a sword). The visual style of both icons is very comic like, which is a typical representation of games in app stores. Hence, with our proceeding, we ensure that the icons used in the experimental study equal common icon designs of mobile gaming apps. This proceeding enabled us to control for potential existing confounding effects of specific design elements of an icon, e.g., symbols or familiar characters, and hence, to investigate, whether the hypothesized relationships were primarily triggered by the experimental factors in general. To minimize a potential systematic bias related to, e.g., game awareness, we only selected icons of mobile games that were shortly introduced to the market before we started with the study. Moreover, to minimize a distortion of the results due to possible distraction effects, we did not provide any further information related to the icon of the mobile gaming app, e.g., name of the game, game principle, consumer reviews or price (Bellizzi and Hite 1992). For the manipulation of the icon colour contrast and the predominant primary icon colour, we used Adobe Colour CC. Adobe Colour CC is an application that supports consumers to try out, create and save various colour schemes (e.g., analogous or complementary). The application enables consumers to manipulate the colours present in an icon as well as the icon colour contrast. An example of the manipulation of one of the two icons of the factorial design is illustrated in Figure 3.3.

**Figure 3.3** Experimental Design (Example)



Using this application, we created six different icons for each of the two mobile gaming apps according to our experimental design. Hence, for each the two icons one version following an analogous contrast and one version following a complementary contrast were created. The second factor (the predominant primary icon colour) was operationalized by manipulating the predominant primary colour within the icons according to the primary colours yellow, red and blue. In the context of our study, a colour is defined as predominant if it exceeds a critical threshold of 50% on average in relation to the total number of pixels of the icon ( $300 \times 300$  pixels).

### *Measures and Procedure*

The participants were randomly assigned to one of the six experimental conditions of the online experiment. Before the participants were exposed to the icon of a mobile gaming app, they had to answer a questionnaire about whether they own a mobile device, e.g., a smartphone or a tablet, which enables them to download and install mobile apps and whether they had downloaded and installed mobile apps from an app store in general each with a single-item on a nominal scale (yes/no). Furthermore, they had to answer questions regarding the overall number of apps they have installed, the number of mobile gaming apps, and their willingness to pay for mobile gaming apps in general. Moreover, we measured the participants' involvement towards mobile apps and their attitude towards mobile apps in general. The involvement towards mobile apps was operationalized according to the semantic differential introduced by Wilcox et al. (2011) on a seven-point scale (3 items, e.g., 1 = not interesting at all—7 = very interesting, Cronbach's  $\alpha = .96$ ). The participants' attitude towards mobile apps was measured by applying the scale of Voss et al. (2003). This proceeding enabled us to differentiate between the utilitarian (5 items, e.g., 1 = unnecessary—7 = necessary, Cronbach's  $\alpha = .89$ ) as well as the hedonic attitudinal dimension (5 items, e.g., = unenjoyable—7 = enjoyable, Cronbach's  $\alpha = .94$ ). We measured the participants' involvement towards mobile gaming again using the approach of Wilcox et al. (2011) on a seven-point scale (Cronbach's  $\alpha = .91$ ). Moreover, the approach of Voss et al. (2003) was also used to operationalize the attitude towards mobile gaming (utilitarian dimension (5 items): Cronbach's  $\alpha = .85$ ; hedonic dimension (5 items): Cronbach's  $\alpha = .92$ ). Last but not least, the participants had to state whether they have a colour vision defect (yes/no) and finally, they had to state if they have a preference for a specific colour.

All of the above-mentioned constructs and variables were used as control variables in the data analysis. If a participant had a colour vision defect, we thanked for her/his willingness to participate in the study. Moreover, such respondents were excluded from the data analysis. After the participants finished the first part of the study, they were informed that in the following they would be exposed to one icon of a mobile gaming app and that they would have to answer questions about their feelings and thoughts with regard to the icon. The participants could inspect the icon as long as they liked, meaning that there were no time-restrictions given. This should have enabled the participants to get a satisfactory impression of the icon. Furthermore, this procedure was chosen to minimize a distortion of the results due to a systematic bias in the experimental design (Bailer et al. 1977). Then, they had to fill out a second questionnaire that included questions about the graphic design of the icon, the predominant primary icon colour, their

evaluation of the harmony as well as their evaluation of the esthetic of the icon design, if they were aware of the icon of the mobile gaming app, their emotions, their attitude towards the icon, the icon's personality, as well as their intent to download the game. Harmony was measured by using the bipolar adjectives of the semantic differential introduced by Schloss and Palmer (2011) on a seven-point scale (3 items, e.g., 1 = disharmonious—7 = harmonious, Cronbach's  $\alpha = .94$ ). The esthetic of the icon was operationalized according to the semantic differential of Wang et al. (2011) using a seven-point scale (4 items, e.g., 1 = unappealing—7 = appealing, Cronbach's  $\alpha = .90$ ). We used the scale of Mehrabian and Russel (1974) to measure the participants' emotional responses on the three dimensions pleasure (6 items, e.g., 1 = unhappy—7 = happy, Cronbach's  $\alpha = .89$ ), arousal (5 items, e.g., 1 = calm—7 = excited, Cronbach's  $\alpha = .88$ ), and dominance (6 items, e.g., 1 = controlled—7 = controlling, Cronbach's  $\alpha = .88$ ). The measures regarding the attitude towards the icon were based on the previous described scale of Voss et al. (2003), which enabled us to distinguish between the impact of icon colour contrast and predominant primary icon colour on the utilitarian (Cronbach's  $\alpha = .91$ ) as well as on the hedonic attitudinal dimension (Cronbach's  $\alpha = .93$ ).

The personality perceptions were assessed by adapting Aaker's (1997) brand personality scale to the context of our study. Hence, we were able to evaluate the impact of the icon colour contrast and the predominant primary icon colour on the personality dimensions sincerity (3 items, e.g., sincere, 1 = I totally disagree—7 = I totally agree, Cronbach's  $\alpha = .78$ ), excitement (3 items, e.g., exciting, Cronbach's  $\alpha = .77$ ), competence (3 items, e.g., reliable, Cronbach's  $\alpha = .76$ ), sophistication (3 items, e.g., good-looking, Cronbach's  $\alpha = .83$ ), and ruggedness (3 items; e.g., robust, Cronbach's  $\alpha = .72$ ). Moreover, the participants had to evaluate their intent to download the app on a single item of a nominal scale (yes/no). Finally, socio-demographic variables were collected. Before we conducted the main study, a small sample ( $n = 13$ ) pretested the questionnaire with respect to the understanding and clarity of items. Several minor changes in wording were made based on this pilot test. To avoid a potential bias from ordering effects, we randomized the scales and the items in the online questionnaire. As we were mainly interested in the impact of the icon colour contrast and in the influence of the predominant primary icon colour in general on the constructs under study within the experimental conditions, the participants' responses were mean aggregated, and the aggregated measures were used as dependent variables in the data analysis. As already mentioned, this proceeding enabled us to control for potential confounding effects and to further investigate, whether the hypothesized relationships were primarily triggered by experimental factors in

general and not by specific design elements of the icon, e.g., symbols, text or familiar characters. Before the data was aggregated, we tested for differences of the participants' responses between the different icons within the experimental conditions. The results of this analysis revealed no significant differences with regard to participants' response to the dependent variables. Therefore, the findings reported in the following include both icons of the mobile gaming apps. Moreover, interaction effects between icon colour contrast and predominant primary icon colour and the participants' emotions, attitude, personality perceptions, and their download intention could be expected. We further investigate the impact of the interaction between the icon colour contrast and predominant primary icon colour in the data analysis. Transferring the assumptions as well as the implications of congruence (congruity) theory (Osgood and Tannenbaum 1955) to the context of icon of mobile gaming apps, an analogous contrast in an icon of a mobile gaming app should be perceived as more harmonious and more esthetically appealing compared to a complementary contrast. According to Schloss and Palmer (2011) the perception of harmony should mainly be induced by the combinations of similar, congruent colours on the colour wheel and not necessarily by the presence of single colours. Hence, we used the participants' evaluations of perceived congruency, harmony as well as their evaluation of the esthetic of the icons as manipulation check for our experimental design. According to Perdue and Summers (1986), ANOVA tests were conducted to check whether the intended manipulation of the icon colour contrast, in terms of an analogous contrast vs. a complementary contrast, was successful. As expected, the results indicate that an analogous contrast in an icon of a mobile gaming app was evaluated as more congruent, more harmonious as well as more esthetically appealing, compared to a complementary colour contrast in the icons of the two mobile gaming apps (harmony:  $M_{\text{analogous}} = 5.32$  (1.3),  $M_{\text{complementary}} = 4.14$  (1.4),  $F(1,165) = 5.362$ ,  $p < .01$ ; esthetic:  $M_{\text{analogous}} = 5.44$  (1.2),  $M_{\text{complementary}} = 4.47$  (1.4);  $F(1,165) = 10.842$ ,  $p < .001$ ), but not affected by the predominant primary colour (esthetic:  $M_{\text{yellow}} = 3.98$  (1.5),  $M_{\text{red}} = 4.15$  (1.4),  $M_{\text{blue}} = 4.08$  (1.6),  $F(2,165) = 0.193$ , n.s.; harmony:  $M_{\text{yellow}} = 4.83$  (1.3),  $M_{\text{red}} = 4.78$  (1.4),  $M_{\text{blue}} = 4.91$  (1.4),  $F(2,165) = 0.984$ , n.s.). The ANOVA tests with perceived harmony and esthetic as dependent variables show no significant interaction effect between the experimental factors. Moreover, the answers of the participants with regard to the graphic design as well as with regard to the predominant primary icon colour of the icon were also used to control for a successful manipulation. About 96% provided correct answers regarding the graphic design as well as the predominant icon colour and we identified no significant differences between the experimental conditions. Overall, the findings above provide empirical evidence

for a successful manipulation due to our experimental design. The participants of our study were recruited in Germany under the pretense that they were needed for a study on the subject “Mobile Apps and consumer Behaviour” by using e-mails and postings on online social networking sites. Overall, the answers of  $N = 172$  participants could be used for the hypothesis testing. These participants reported no colour vision defect and completed both questionnaires (women: 55.6%,  $M_{age} = 27.02$  years,  $SD = 9.0$ ). 68.2% of the participants were students and 29.9% were employed. Every participant in our study stated to own at least one mobile device (e.g., a tablet computer or a smartphone), which offers the functionality to access an online app store as well as to download and run mobile apps. The average number of mobile apps the participants had installed on their mobile devices was  $M = 24.35$  ( $SD = 21.16$ ). This relatively high average number of mobile apps results from typical basic pre-installed applications like internet-browsers, messengers and utility programs on mobile devices. Moreover, on an average the participants stated that they had downloaded and installed  $M = 4.52$  ( $SD = 8.43$ ) mobile gaming apps on their mobile device. Interestingly, only 26.2% of the participants were willing to pay for a mobile gaming app in general ( $M = 4.02$  ( $SD = 10.3$ ) Euros). Involvement towards mobile apps in general was  $M = 3.65$  ( $SD = 1.7$ ) and the involvement towards mobile gaming apps was  $M = 5.32$  ( $SD = 1.2$ ). With regard to the attitudinal measures, the evaluation of utilitarian dimension of the attitude towards mobile apps was  $M = 3.58$  ( $SD = 1.8$ ) and the hedonic dimension was evaluated with  $M = 4.29$  ( $SD = 1.7$ ). The participants’ attitude towards mobile gaming was evaluated more positive, especially on the hedonic attitudinal dimension (utilitarian dimension:  $M = 3.89$ ,  $SD = 1.4$ ; hedonic dimension:  $M = 4.72$ ,  $SD = 1.4$ ). As expected, the participants’ awareness of the icons selected was considerably low ( $M = 2.1$ ,  $SD = 1.2$ ) and did not significantly differ between the two icons selected for our experimental study. Moreover, we obtained no significant differences between the six experimental conditions with regard to the previous mentioned variables. Overall, the participants were nearly equally distributed across the six experimental conditions and we obtained no significant differences with regard to age, gender, and a preference for a specific colour between the experimental conditions.

### 3.2.4 Results

In hypothesis H1a and H1b, we assumed that the experienced emotions are affected by the colour contrast and the predominant primary colour of an icon

of a mobile gaming app. The consumers' experienced emotions should be positively influenced by an analogous contrast. Furthermore, the predominant primary colour of an icon should have an impact on the experienced emotions as well. To test H1a and H1b, we conducted several ANOVAs with the emotional dimensions pleasure, arousal, and dominance as dependent variables. Table 3.8 summarizes the mean values for each emotional dimension in the experimental conditions. The results of the ANOVA analyses show a significant main effect of the icon colour contrast on each of the emotional dimensions. Pleasure, arousal, and dominance were positively affected by an analogous colour contrast in an icon of a mobile gaming app (pleasure:  $M_{\text{analogous}} = 4.30$  (0.9),  $M_{\text{complementary}} = 4.01$  (0.9),  $F(1, 163) = 3.980$ ,  $p < .05$ ,  $\eta^2 = .023$ ; arousal:  $M_{\text{analogous}} = 4.07$  (1.1),  $M_{\text{complementary}} = 3.75$  (1.1),  $F(1, 163) = 2.908$ ,  $p < .1$ ,  $\eta^2 = .018$ ; dominance:  $M_{\text{analogous}} = 4.48$  (SD = 0.9),  $M_{\text{complementary}} = 4.11$  (1.1),  $F(1, 163) = 4.814$ ,  $p < .05$ ,  $\eta^2 = .029$ ). Hence, we obtained empirical support for H1a. Interestingly, the findings did not show a significant main effect of the predominant primary icon colour on the emotional dimensions (pleasure:  $F(2, 163) = 0.685$ , n.s.; arousal:  $F(2, 163) = 1.378$ , n.s.; dominance:  $F(2, 163) = 2.657$ , n.s.), not supporting H1b. We conclude that combinations of colours hinder the impact of a single colour on the consumers' emotions, which were identified in previous studies (e.g., Valdez and Mehrabian 1994). Moreover, the findings show no significant interaction effect between the experimental factors icon colour contrast and predominant primary icon colour on the emotional dimensions (pleasure:  $F(2, 163) = 0.758$ , n.s.; arousal:  $F(2, 163) = 0.455$ , n.s.; dominance:  $F(2, 163) = 2.329$ , n.s.). Interestingly, in the complementary contrast condition, we identified a significant impact of predominant primary icon colour red on dominance ( $F(2, 73) = 3.685$ ,  $p < .05$ ).

*The Effects of Icon Colour Contrast and Icon Colour on Attitude towards the Icon*  
In H2a and H2b, we proposed that the icon colour contrast and the predominant primary icon colour would influence the attitude towards the icon. According to our assumptions, an analogous contrast should lead to a more positive attitude towards the icon compared to a complementary contrast. The findings in Table 3.9 show that specifically the hedonic attitudinal dimension was influenced by the icon colour contrast, while the utilitarian dimension was not affected. If colour combinations within an icon of a mobile gaming app result in an analogous contrast, this has a positive impact on hedonic attitudinal aspects ( $M_{\text{analogous}} = 4.31$  (1.3),  $M_{\text{complementary}} = 3.82$  (1.4),  $F(1, 168) = 5.155$ ,  $p < .05$ ,  $\eta^2 = .031$ ). Overall, this finding partially supports H3a. Again, and contrary to our

**Table 3.8** Consumer Responses to the Emotional Dimensions

<i>Pleasure</i>						
<i>Factors</i>	<i>Predominant Primary Colour (PC)</i>			<i>F</i>		
	<i>Yellow</i>	<i>Red</i>	<i>Blue</i>	<i>PC</i>	<i>CC</i>	<i>PC * CC</i>
<i>Colour Contrast (CC)</i>	<i>Yellow</i>	<i>Red</i>	<i>Blue</i>			
<i>Analogous Contrast</i>	4.40 (1.0)	4.21 (1.0)	4.30 (0.8)	0.685	3.880**	0.758
<i>Complementary Contrast</i>	4.12 (1.1)	4.14 (0.8)	3.78 (0.9)			
<i>Arousal</i>						
<i>Factors</i>	<i>Predominant Primary Colour (PC)</i>			<i>F</i>		
	<i>Yellow</i>	<i>Red</i>	<i>Blue</i>	<i>PC</i>	<i>CC</i>	<i>PC * CC</i>
<i>Colour Contrast (CC)</i>	<i>Yellow</i>	<i>Red</i>	<i>Blue</i>			
<i>Analogous Contrast</i>	3.94 (1.3)	4.17 (1.1)	4.09 (1.0)	1.378	2.908*	0.455
<i>Complementary Contrast</i>	3.66 (1.2)	4.07 (1.1)	3.56 (1.0)			
<i>Dominance</i>						
<i>Factors</i>	<i>Predominant Primary Colour (PC)</i>			<i>F</i>		
	<i>Yellow</i>	<i>Red</i>	<i>Blue</i>	<i>PC</i>	<i>CC</i>	<i>PC * CC</i>
<i>Colour Contrast (CC)</i>	<i>Yellow</i>	<i>Red</i>	<i>Blue</i>			
<i>Analogous Contrast</i>	4.60 (0.9)	4.52 (0.9)	4.30 (0.9)	2.657	4.814**	3.685**
<i>Complementary Contrast</i>	3.87 (1.1)	4.58 (0.8)	3.95 (1.2)			

Note: \* .05  $p < 0.1$ ; \*\*  $p < .05$ ; \*\*\*  $p < .001$ ; Mean (SD in brackets)

expectations, we obtained no empirical evidence for the impact of the predominant primary icon colour on attitude (hedonic attitudinal dimension:  $F(2,168) = 0.475$ , n.s.; utilitarian attitudinal dimension:  $F(2,168) = 0.234$ , n.s.) not supporting H2b. Moreover, no significant interaction effect between colour contrast and icon colour on attitude could be identified (hedonic attitudinal dimension:  $F(2,168) = 0.170$ , n.s.; utilitarian attitudinal dimension:  $F(2,168) = 0.591$ , n.s.).

#### *The Effects of Icon Colour Contrast and Icon Colour on Icon Personality*

With regard to perception and evaluations of personality, we surmised in hypothesis H3a that an analogous contrast would positively influence personality perception and evaluations towards an icon of a mobile gaming app. In H3b we assumed that the predominant primary colour present in an icon should also have an influence on personality perceptions. Furthermore, we also controlled for a potentially existing interaction effect. The mean values of the consumer responses to the different personality dimensions are presented in Table 3.10. The



**Table 3.9** Consumer Responses to Attitudinal Dimensions towards the Icon

<i>Hedonic Attitudinal Dimension</i>						
<i>Factors</i>	<i>Predominant Primary Colour (PC)</i>			<i>F</i>		
	<i>Yellow</i>	<i>Red</i>	<i>Blue</i>	<i>PC</i>	<i>CC</i>	<i>PC * CC</i>
<i>Colour Contrast (CC)</i>						
<i>Analogous Contrast</i>	4.12 (1.5)	4.32 (1.2)	4.48 (1.2)	0.475	5.155**	0.170
<i>Complementary Contrast</i>	3.71 (1.4)	3.97 (1.2)	3.82 (1.6)			
<i>Utilitarian Attitudinal Dimension</i>						
<i>Factors</i>	<i>Predominant Primary Colour (PC)</i>			<i>F</i>		
	<i>Yellow</i>	<i>Red</i>	<i>Blue</i>	<i>PC</i>	<i>CC</i>	<i>PC * CC</i>
<i>Colour Contrast (CC)</i>						
<i>Analogous Contrast</i>	4.63 (1.3)	4.83 (1.1)	4.55 (1.0)	0.234	1.275	0.591
<i>Complementary Contrast</i>	4.63 (1.2)	4.33 (1.1)	4.38 (1.0)			

Note: \* .05  $p < 0.1$ ; \*\*  $p < .05$ ; \*\*\*  $p < .001$ ; Mean (SD in brackets)

findings show that the personality dimensions sincerity, excitement, competence, and sophistication are influenced by the icon colour contrast.

As expected, an analogous contrast in an icon of mobile gaming app positively influences these personality dimensions, while ruggedness was not affected (sincerity:  $M_{\text{analogous}} = 4.29$  (1.1),  $M_{\text{complementary}} = 3.81$  (1.3),  $F(1,168) = 6.902$ ,  $p < .01$ ,  $\eta^2 = .041$ ; excitement:  $M_{\text{analogous}} = 4.20$  (1.3),  $M_{\text{complementary}} = 3.83$  (1.4),  $F(1, 168) = 3.251$ ,  $p < .1$ ,  $\eta^2 = .020$ ; competence:  $M_{\text{analogous}} = 4.46$  (1.1),  $M_{\text{complementary}} = 4.06$  (1.3),  $F(1,168) = 4.883$ ,  $p < .05$ ,  $\eta^2 = .030$ ; sophistication:  $M_{\text{analogous}} = 3.48$  (SD = 1.2),  $M_{\text{complementary}} = 3.09$  (1.2),  $F(1,168) = 4.333$ ,  $p < .05$ ,  $\eta^2 = .027$ ). Hence, H3a was partially supported. Contrary to our expectations, we did not obtain empirical support for the hypothesized impact of predominant primary icon colour on the personality dimensions (sincerity:  $F(2,168) = 0.856$ ; n.s.; excitement:  $F(2,168) = 0.271$ , n.s.; competence:  $F(2, 168) = 0.339$ , n.s.; sophistication:  $F(2,168) = 0.977$ , n.s.; ruggedness:  $F(2,168) = 0.003$ , n.s.). Therefore, H3b has to be rejected. Based on these findings, one might conclude that colour combinations will diminish the impact of single colours on the perception and evaluation of the personality dimensions, which have been investigated in previous studies (e.g., Labrecque and Milne 2012). Furthermore, as a result of the data analysis no significant interaction effect between the experimental factors of our study on personality could be identified (sincerity:  $F(2,168) = 0.120$ , n.s.; excitement:  $F(2, 168) = 1.504$ , n.s.; competence:  $F(2,$

**Table 3.10** Consumer Evaluations of the Personality Dimensions

<b>Sincerity</b>						
<b>Factors</b>	<b>Predominant Primary Colour (PC)</b>			<b>F</b>		
<i>Colour Contrast (CC)</i>	<i>Yellow</i>	<i>Red</i>	<i>Blue</i>	<i>PC</i>	<i>CC</i>	<i>PC * CC</i>
<i>Analogous Contrast</i>	4.23 (1.0)	4.26 (1.1)	4.41 (1.2)	0.856	6.902 **	0.120
<i>Complementary Contrast</i>	3.64 (1.3)	3.77 (1.0)	4.04 (1.5)			
<b>Excitement</b>						
<b>Factors</b>	<b>Predominant Primary Colour (PC)</b>			<b>F</b>		
<i>Colour Contrast (CC)</i>	<i>Yellow</i>	<i>Red</i>	<i>Blue</i>	<i>PC</i>	<i>CC</i>	<i>PC * CC</i>
<i>Analogous Contrast</i>	4.03 (1.4)	4.17 (1.3)	4.44 (1.1)	0.271	3.251 *	1.504
<i>Complementary Contrast</i>	4.12 (1.4)	3.66 (1.4)	3.68 (1.5)			
<b>Competence</b>						
<b>Factors</b>	<b>Predominant Primary Colour (PC)</b>			<b>F</b>		
<i>Colour Contrast (CC)</i>	<i>Yellow</i>	<i>Red</i>	<i>Blue</i>	<i>PC</i>	<i>CC</i>	<i>PC * CC</i>
<i>Analogous Contrast</i>	4.23 (1.1)	4.50 (1.2)	4.62 (1.0)	0.339	4.883**	0.755
<i>Complementary Contrast</i>	4.12 (1.2)	3.86 (1.0)	4.12 (1.6)			
<b>Sophistication</b>						
<b>Factors</b>	<b>Predominant Primary Colour (PC)</b>			<b>F</b>		
<i>Colour Contrast (CC)</i>	<i>Yellow</i>	<i>Red</i>	<i>Blue</i>	<i>PC</i>	<i>CC</i>	<i>PC * CC</i>
<i>Analogous Contrast</i>	3.40 (1.1)	3.44 (1.2)	3.65 (1.2)	0.977	4.333**	0.167
<i>Complementary Contrast</i>	2.88 (1.2)	3.18 (1.0)	3.27 (1.4)			
<b>Ruggedness</b>						
<b>Factors</b>	<b>Predominant Primary Colour (PC)</b>			<b>F</b>		
<i>Colour Contrast (CC)</i>	<i>Yellow</i>	<i>Red</i>	<i>Blue</i>	<i>PC</i>	<i>CC</i>	<i>PC * CC</i>
<i>Analogous Contrast</i>	4.19 (1.1)	4.62 (1.1)	4.10 (1.2)	0.003	0.010	2.654
<i>Complementary Contrast</i>	4.43 (1.2)	4.03 (1.1)	4.51 (1.5)			

Note: \* .05  $p < 0.1$ ; \*\*  $p < .05$ ; \*\*\*  $p < .001$ ; Mean (SD in brackets)

168) = 0.755, n.s.; sophistication:  $F(2,168) = 0.167$ , n.s.; ruggedness:  $F(2,168) = 2.654$ , n.s.).

#### *The Effects of Icon Colour Contrast and Icon Colour on Download Intention*

In hypothesis H4a, we proposed an impact of the icon colour contrast on download intention. Overall, 19.8% of all participants stated that they would consider downloading the mobile game onto their mobile device. The findings of a chi-square test reveal that an analogous contrast positively influences the intent to download the game, supporting H4a. In the experimental conditions with the analogous colour contrast, 24.5% of the participants stated that they intend to download the game, while in the conditions with a complementary contrast only 14.1% of the participants would consider downloading the game (Chi-square = 2.888,  $p < .1$ ). Interestingly, the findings provided no empirical evidence for the assumed direct effect of predominant primary icon colour on download intention, not supporting H4b (yellow: 7.0%, red: 9.3%, blue: 3.5%; Chi-square = 3.838, n.s.). Furthermore, based on our findings no significant interaction between the experimental factors and download intention could be obtained. To test the proposed mediating impact of the emotional dimensions between the icon colour contrast, the predominant primary icon colour and the further outcome variables under investigation (H5), we used PROCESS (model 4) as suggested by Zhao et al. (2010), which enables consumers to conduct mediation analysis according to the approach of Baron and Kenny (1986). Contrary to our expectations derived from the findings of previous studies, the results did not reveal any significant mediating impact of the emotional dimensions pleasure, arousal, and dominance on the hypothesized relationships. Hence, we obtained no empirical support for our assumptions in H5.

### **3.2.5 Discussion and Conclusion**

By transferring the assumptions and implications of congruence theory (Osgood and Tannenbaum 1955) as well as the “match up” hypothesis (Kamis 1990) to the context of icons of mobile gaming apps, the basic idea of our study was that an analogous contrast—a combination of similar colours—used in icon of a mobile gaming app would positively influence the consumers’ experienced emotions, their attitude towards the icon, their perception and evaluation of icon personality, and their download intention. Moreover, we proposed that the predominant primary icon colour would influence the consumer-related outcome variables under study as well. We were able to show that analogous contrasts in icons of mobile

gaming apps have a positive direct effect on the emotional dimensions pleasure, arousal, and dominance. Furthermore, using an analogous contrast positively influences hedonic attitudinal aspects towards the icon, while the utilitarian attitudinal dimension is not influenced by the kind of the contrast. One reasonable explanation for these effects is that mobile gaming and hence, mobile gaming applications are in general strongly associated with hedonic aspects from the perspective of the consumers, e.g., relaxation or entertainment (Lee et al. 2005; Okazaki 2008). Moreover, the results of the present study show that using an analogous colour contrast in the icon of mobile gaming apps positively influences several personality dimensions related to the icon and potentially towards the mobile game as well. At least in our research setting, the results of the present study further indicate that using an analogous contrast in an icon of a mobile gaming app will lead to a higher download intention. In this context, the findings of the present study are in line with the results of Gorn et al. (1997) as well as Schloss and Palmer (2011), which have also shown that combinations of similar, congruent colours within a stimulus result in positive consumer-related responses. Contrary to our expectations, the findings of our experimental study did not support our assumption that the outcome variables under investigation should be influenced by the predominant primary icon colour. This result indicates that colour contrasts might diminish the effects of single colours on consumers' perceptions and evaluations as well as on their intentional behaviour, which have been identified in previous studies. Emotional responses do not mediate the relationship between the icon colour contrast, the predominant primary icon colour and emotion, attitude towards the icon, icon personality, and download intention. According to Miniard et al. (1991) one might conclude that involvement towards the product category might act as a moderator of the strength of the relationship between experimental factors and the consumer-related outcome variables under study. The operationalization of involvement towards the product category as a potential moderating effect is often applied in empirical research (Eroglu et al. 2001; Miniard et al. 1991; Petty et al. 1983). Involvement is of relevance for a consumer's information processing and the degree of cognitive elaboration and the persuasive impact of the processed information (Celsi and Olson 1988; Petty and Cacioppo 1986; Swinyard 1993). Hence, we controlled for the potential moderating impact of involvement towards mobile gaming in an additional analysis using moderated regression as suggested by Baron and Kenny (1986). The results show that involvement has a positive impact on emotions, especially pleasure ( $\beta = .221, p < .01$  and arousal ( $\beta = .203, p < .01$ ), on the hedonic dimension of attitude towards the icon ( $\beta = .197, p < .05$ ), on the perception and evaluation of competence ( $\beta = .189, p < .05$ ), and on download intention ( $\beta = .236, p < .01$ ).

However, we identified no moderating impact towards mobile gaming between the experimental factors and the dependent variables of our study. However, the identified positive direct effects of an analogous colour contrast on the constructs under investigation are an interesting result for online consumer research. More precisely, it seems that the interaction with single colours does not matter for app developers, publishers, and app store providers when several colours are combined in an icon of a mobile gaming app. Thereby, our results also provide insights for an effective and efficient design of an icon of mobile applications in app stores with the emphasis on mobile gaming apps.

Our results have important implications for future research on the impact of colour combinations on consumer behaviour, which are related to the limitations of the present study. First, we only analyzed the impact of icon colour contrast and predominant primary icon colour in one specific category of mobile applications, namely mobile gaming apps. Hence, future research should investigate if our findings also hold in other categories of mobile apps, e.g., business or education, which are mainly used for utilitarian purposes. Moreover, in general colours are described by specific attributes, namely hue, saturation, and lightness and the impact of colour on consumers' perceptions and evaluations might differ according to the design of these elements (Labrecque and Milne 2012). In our study, we only manipulated colour hue of the predominant primary colour of an icon of a mobile gaming app. In this context, the findings of Deng et al. (2010) indicate that consumers of the NikeID online shoe configurator de-emphasize lightness, but focus on colour hue and saturation, while in the context of brand logo design, the results of Labrecque and Milne (2012) imply that colour lightness will also impact consumer-related perceptions and evaluations of the brand. Given these inconsistent findings, future research should consider the impact of a manipulation of the other colour attributes (saturation and lightness) not only in isolation but also in combination with different hues on consumer-related outcome variables. Moreover, it further might be relevant to address the impact of the use of different visual elements used within the icon, e.g., a humanoid character, on the consumer decision-making in future studies. Such findings might help to design attractive and appealing icons, which in turn should positively contribute to the success of a mobile gaming app.

In the experimental study the participants were only exposed to one single icon of a mobile gaming app, but in app stores consumers are normally exposed to more than one icon and additional information (e.g., name of the game, verbal information, price, ratings, screenshots, reviews) are provided as well. In an app store the icon of a mobile application is usually not presented without any related information. Hence, future studies should investigate if the findings of the

presented study will still hold when the hypotheses are tested in an experimental setting that includes and systematically manipulates additional information related to the app, because it seems to be unclear if, e.g., a consumer's intention to download the app is only influenced by the icon colour contrast or if it is a linear sum the effects of the colour information contained in the icon of a mobile (gaming) application or whether some of the previous mentioned aspects have a stronger impact on or will not significantly contribute to the download intention and further consumer-related outcome variables. In a follow up study ( $N = 211$ ), we used a choice based conjoint measurement approach to get a first impression of the potential existing impact of the previously mentioned other aspects displayed in app store on the consumers' perceptions and evaluations as well as the potential existing interdependencies between these factors and the icon of a mobile gaming app. For this study, we designed a 10-choice-set questionnaire embedded in the conjoint-design. Each choice set contained three hypothetical game apps with six attributes (icon of the mobile gaming app, name of the game, genre, price, average consumer rating, total number of consumer ratings), with three levels per attribute, which were systematically randomized, and we only included mobile gaming apps that were shortly introduced to the market and therefore, were unfamiliar for each participant. In addition, we ensured that there are no attribute-level combinations, which generate prohibited pairs or unfeasible game alternatives.

Based on findings related to the average importance of the six attributes, the results of this conjoint analysis reveal that the icon of a mobile gaming app, the price, and a positive average consumer rating all significantly contributed to the participants download decision, while the other attributes (name of the game, genre, total number of consumer ratings) had only a marginal impact on the decision for a mobile gaming app in our conjoint setting. These findings are in line with the assumptions and implications derived from multiattribute theory by Hauser and Urban (1979). In addition to the findings of our experimental study, the findings of the conjoint study provide further empirical evidence that the icon of a mobile gaming app in general seems to be relevant for deciding whether or not to download a mobile game. But future research—including eye-tracking studies—is needed to better understand the underlying processes of the impact of the different attributes of mobile applications, their interdependencies, as well as of other attributes, which are strongly related to the design of the app store in general (e.g., usability and background colour) on consumer behaviour, not only in the context of mobile gaming apps. Moreover, the sample size of the present study was relatively small. As the sample size determines the amount of error inherent to the results of statistical testing, the effects of an experimental

treatment are more difficult to identify in small samples (Cohen 2013). Hence, future research is advised to conduct similar experimental studies with larger sample sizes, which will strengthen the statistical power of the hypothesis testing and potentially help to identify more significant effects of the experimental factors on the constructs under study.

Last but not least, our experiment was limited to mobile applications from one specific category, namely mobile gaming apps and was only conducted in one country. Because of this limited external validity, future research is needed to study the identified effects with different products in different product categories. The sample was conducted among consumers in Germany. Prior research in personality and consumer behaviour shows several important differences in personalities with respect to demographic variables (e.g., age, culture, and education) and differences in general online behaviour between countries. Furthermore, previous research on the impact of colours on consumer behaviour has shown that consumers with different cultural backgrounds are supposed to have different associations and preferences for specific colours (Aslam 2006). This potentially might result in differences regarding, e.g., consumers' attitude formation or the evaluation of brand personality of the same product (Block and Kramer 2009). In follow-up research, this and the previously mentioned issues should be addressed. App developers, publishers, and app store providers can consider the findings of our study to better attract the consumer of mobile gaming apps due to an effective and efficient as well as appealing icon design. Our results show that an analogous contrast in an icon of a mobile gaming app could lead to positive effects as they positively influence consumer-related outcomes. Beside this, previous research has shown that other additional information, e.g., consumer reviews, the price of the mobile gaming app, has an impact on the consumers' intent to download a game from an app store (Liu et al. 2014; Zhu and Zang 2010). Hence, to better understand the role of colour combinations in the design of icons for mobile gaming apps as well as to provide further evidence regarding the importance of colour combinations for icon design, we analyzed the colour information and collected additional information of the top 100 mobile gaming apps in the iTunes-App store in November 2015. The data included information on the icon colour contrast, the five most dominant colours present in the icon, the price of the mobile game (also including freemium revenue strategies), the number of consumer reviews, and the average consumer rating of the different mobile gaming apps. The first interesting result of the data analysis was that only 24.5% of the icons under investigation followed an analogous contrast. The previously mentioned variables were used as independent variables in a multiple regression analysis with an overall evaluation

of the mobile games in the market from the website *sensortower.com* as dependent variable. The website *sensortower.com* estimates the value of each mobile gaming app based on, e.g., the position of the app in the ranking of the app store and the expired time from the release date. As expected, the results of the multiple regression analysis revealed a positive impact of the number of consumer reviews ( $\beta = .345, p < .01$ ) on the value of the mobile gaming app. But interestingly, even while all of the selected top 100 mobile gaming apps were considerably successful, the value of a mobile gaming was significantly influenced by the icon colour contrast ( $\beta = .161, p < .05$ ). More precisely, an increase in the similarity of the colours combined in an icon positively influences the value of the mobile game. The other independent variables had no significant impact on the dependent variable. The results of this additional analysis are in line with the findings derived from the previously described choice based conjoint study. Both additional analyses support our implications derived from our experimental study, but they have also shown that app developers, publishers and app store providers should not only be aware of the relevance of the icon and the colour combinations used within the icon, but also of other attributes of a mobile gaming app that will contribute to the success of mobile gaming apps, e.g., the number of consumer reviews, the average consumer rating, and the pricing strategy. As mentioned before, the effects of the experimental factors on consumer-related outcome variables might also be influenced by culture (e.g., Cyr et al. 2009). In the context of website design, the findings of Cyr et al. (2010) reveal that website colour appeal is a significant determinant for website trust and satisfaction with differences noted across cultures. Therefore, companies should be aware of potentially existing cross-cultural differences with regard to the impact of colours, colour combinations, and further design elements and how icons for mobile gaming apps should be adjusted according to the preferences and requirements of the consumers based on the cultural background of the target groups in different international markets. Finally, the findings of our study might not only be of interest in the context of mobile gaming apps, but also for website design in general. According to previous research (e.g., Deng et al. 2010, Bonnardel et al. 2011) as well as based on the findings of the present study, the appeal a consumer feels toward a particular colour scheme can have a significant impact on his or her experience while interacting, e.g., with a website or a product in an online shop, with implications for the consumer's perception and evaluation of the present content as well as for trust, satisfaction, or future interaction with the website (e.g., Cyr 2008; Lee and Rao 2010). In online environments where consumer confidence is often low and fragile, one might conclude that subtle design differences can push online consumers toward either completing transactions or



abandoning a decision, not only in the context of mobile gaming apps (Cyr et al. 2010).

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### **3.3 The Role of Visual Congruence for Brands in Influencing Consumer Behaviour**

#### **3.3.1 Introduction**

Colours are one of the most important visual design elements for shaping consumer's perception and brand evaluation. In short, they draw consumer's attention, trigger certain associations, and subsequently change consumer behaviour (Macklin, 1996; Hine, 1997; Lee et al., 2014; Bagchi and Cheema, 2012; Hagtvedt and Brasel, 2017). Marketers use specific colours for the visual appearance of a brand with regard to the company logo, product presentations, advertisements and online presence. Colors are an effective communication tool to shape brand's visual identity and establish strong relationships with the target audience. From a psychological point of view, colours influence consumers' emotional responses, attitudes, and level of trust toward a brand, which in turn also influence consumer behaviour (Gorn et al., 1997; Valdez and Mehrabian, 1994; Bottomley and Doyle, 2006; Elliot et al., 2007; Metha and Zhu, 2009). The relevant literature highlights how the deliberate use of colours in a company logo design directly influences the esthetic appeal and brand value. For example, the color red in a logo is perceived as particularly exciting, while colour blue is more associated with competence and trust. Meanwhile, research finds that the colour yellow does not influence consumer-related outcome variables (Labrecque and Milne, 2012; Schmitt and Simmons, 1997). Bellizzi and Hite (1992) and Lichtlé (2007) show that, regarding product presentations, specific colours attract consumers' attention due to certain perceptual qualities. The esthetic appeal of a product presentation subsequently activates positive or negative emotions and attitudinal formations toward the presented product and brand, leading to a changed consumer behaviour (Bonnardel et al., 2011; Coursaris and van Osch, 2016; Deng et al., 2010; Bellizzi and Hite, 1992; Bagchi and Cheema, 2013). In addition, in terms of consumers' emotional response, the colour red causes a higher level of arousal than blue. However, a higher level of arousal does not necessarily lead to a favorable change in consumer behaviour. For example, if products are presented in front of a blue background, they are evaluated more positively than products presented in front of a red background (Bellizzi and Hite, 1992), while red backgrounds increase consumers' willingness to pay (Bagchi and Cheema,

2013). In the context of advertisements, the research findings of Lothia et al. (2003) showed that the colours used in banner advertisements influence the click-through rate. In addition, a study by Nitse et al. (2004) implies that colours also influence the quality expectations of the advertised product, affecting consumer satisfaction and purchasing behaviour as well. Gorn et al. (2004) show that the colours used in companies' online presence influence websites' perceived performance and quality, affecting consumers' evaluation and behaviour. For example, a website coloured primarily in blue, lead to a relaxing effect. Therefore, loading times are more likely to be tolerated. Moreover, such effects are also relevant in an offline context, as colours impact the perceived store's atmosphere (Baker et al., 1994; Belizzi et al., 1983). However, all the above studies focus chiefly on single-coloured objects and omit the influence of colour combinations. Nevertheless, an approach focusing on combinations of colours could be important, as visual stimuli observed by consumers are rarely unicoloured. For example, companies are using colour combinations and color contrasts within a brand logo (e.g., "Fanta" with a purple font in front of an orange background). Furthermore, photos published on websites or social media platforms are creating different colour contrasts next to each other (e.g., the profile of Apple Inc. or Adidas AG is very colourful on Instagram). However, only a few studies analyzed the impact of colour combinations on consumer responses like Noiwan and Norcio (2006) and Deng et al. (2010). Both studies imply that most consumers prefer combinations of similar colours, as such combinations are getting perceived as more congruent, harmonious, and esthetically appealing (Schloss and Palmer, 2011). In this context and based on the assumptions of congruence theory (Osgood and Tannenbaum, 1955), research agrees that congruent stimuli, such as combinations of specific elements, cause a more positive perception and evaluation of an object than incongruent stimuli (Till and Busler, 2000). In the context of online consumer behaviour, van Rompay et al. (2010) investigate the impact of the picture-text congruity of an online hotel booking website. The findings of this study show, that picture-text congruence has a positive impact on the attitude towards a product due to an increase in consumer's processing fluency of the presented information. Furthermore, Moore et al. (2005) imply that congruity between banner advertising and website context positively influences consumers' attitudes toward the advertising, and the effect is further influenced by the banner colour. Nevertheless, we argue that there is a lack of research focusing on the effects of an object's visual congruence, colour harmony, and esthetic appeal on consumer-related outcome variables. Therefore, we conducted five experiments with different stimuli and presentation techniques: a company logo, a social media account, a mobile app, a YouTube video, and an online shop to investigate the

influence of different colours and colour contrasts on consumers' perception and evaluation of a brand. The respective settings for the experiments represent typical consumer touchpoints with a brand in a digital environment. Daily use of the internet and social media has changed consumer behaviour and how companies market their products. Consumers spend an increasing amount of time in an online environment, searching online for products, communicating with other consumers, and engaging with companies. Therefore, managers have responded to this shift in consumer behaviour, making digital and social media essential in their marketing strategies. Thus, contact with the brand, social media channels, advertisements, and websites are typical consumer touchpoints that allow companies to engage with their customers, improve brand awareness, influence consumer emotions, and increase sales (Algharabat et al., 2018; Kapoor et al., 2018). Therefore, our findings contribute to consumer research knowledge in many ways by systematically manipulating the predominant primary colour of an object (first experimental factor) and the colour contrast produced by a secondary colour (second experimental factor). More specifically, we investigate: 1) how colour contrast in the visual appearance of an object affects the perceived colour harmony, esthetic appeal, consumers' emotional response, attitude, level of trust and consumer behaviour; 2) we analyze how the predominant primary colour influences consumer-related dependent variables; 3) we further investigate how consumers' emotional responses have a mediating influence on the relationships between the predominant primary colour and colour contrast on consumer behaviour, based on Holbrook and Batra (1987); and 4) we present the results of an eye-tracking experiment to gain further insight into how consumers perceive and cognitively process colours and colour contrasts.

### **3.3.2 Theoretical Background and Hypotheses Development**

Schloss and Palmer (2010) argued that consumers generally perceive an analogous colour contrast as more harmonious and more esthetically appealing. Based on the colour theory from Itten (1973), an analogous colour contrast is defined as a group of colours positioned side by side to each other on the colour wheel (Figure 3.1), meaning they are visually congruent to each other. For example, there is an analogous colour contrast between the colour yellow and the colour green, between the colour red and the colour orange and between the colour blue and the colour purple. In contrast, a complementary colour contrast is created by a combination of colours that are opposed to each other on the colour wheel (Itten 1973). Such colours generate the largest possible colour contrast.

This includes, for example, the contrast between yellow and purple, between red and green and between orange and blue. Such complementary colour contrasts are visually perceived as incongruent.

Based on the results of Schloss and Palmer's (2010) study, a complementary colour contrast is generally rejected by consumers because such a colour contrast is perceived as less harmonious and less esthetically appealing than an analogous colour contrast. However, Schloss and Palmer (2010) did not investigate whether the esthetic appeal influences consumer's perception and evaluation of a brand. Based on the basic assumptions of the congruence theory (Osgood and Tannenbaum 1955), we argue that a congruent stimulus leads to an overall more positive evaluation of an object, compared to an incongruent stimulus (Till and Busler, 2000; Moore et al., 2005; Rompay et al., 2010). The assumption that congruence between different objects as well as between the elements within an object has a positive effect on consumer's perception and evaluation of the brand is also supported by the "match-up" hypothesis (Kamis, 1990; Till and Busler, 2000). This hypothesis implies that combinations of elements within an object are more effective when there is a high degree of congruence between the individual elements. By transferring the basic assumptions of the congruence theory (Osgood and Tannenbaum, 1955) into the context of our experiments, we also assume that consumers appreciate the harmonious and esthetic appeal of an analogous colour contrast within and between different objects (e.g., logo, product representations, advertisements, and website elements). In summary, the following hypotheses can be assumed:

- H1a:** An analogous colour contrast (vs. a complementary colour contrast) will positively (vs. negatively) affect the colour harmony perceived by consumers.
- H1b:** A analogous colour contrast (vs. a complementary colour contrast) will positively (vs. negatively) affect the esthetic appeal for consumers.

#### *Impact of Colour Contrast on Consumers Emotional Response*

The results of the studies by Garrett's (2003) and Rosen and Purinton's (2004) show that the visual design of a brand has an influence on consumer's emotional responses. In addition, Phelps et al. (2006) showed that emotions generally draw consumer's attention to the brand and thus also influence the evaluation process. Further studies also confirmed the correlation between emotions and the evaluation of a brand or product (Sautter et al., 2004; Thüring and Mahlke, 2007; Zhou et al., 2007). In this context, the appraisal theory suggests that individuals first evaluate situations cognitively, leading to the formation of emotions (Lazarus,

1984). Cognitive appraisal is influenced by the degree of congruence between different elements within an object. For example, Éthier et al. (2006) showed that the design of a website interface influences the cognitive appraisal of a consumer and in turn influences consumer's experienced emotions. In the context of our research, we assume that an analogous colour contrast should also lead to a more positive emotional responses, than a complementary colour contrast, since congruent colours are getting perceived as more harmonious and more esthetically appealing.

We also analyze the influence of the predominating primary colour as well, since this influence has been extensively investigated by numerous researchers. Gorn et al. (1997) and Ou et al. (2004) provided empirical evidence for the influence of one colour on consumer's emotional responses. Furthermore, Valdez and Mehrabian (1994) showed that colours have an influence on all dimensions of the Pleasure-Arousal-Dominance (PAD) emotion model by Mehrabian and Russell (1974). For example, the primary colour blue is perceived as more pleasant and more sophisticated than the primary colour yellow, while the latter positively impacts arousal and is also associated with a stronger effect within the dominance dimension. Furthermore, different colours are associated with different perceptions and evaluations of product presentations, advertisements or websites (Cyr et al., 2009; Gorn et al., 1997; Labrecque and Milne, 2012). Based on the above discussion, we hypothesize the following:

- H2a:** An analogous colour contrast (vs. a complementary colour contrast) will positively (vs. negatively) influence consumer's experienced emotions.
- H2b:** The predominant primary colour will influence consumer's experienced emotions.

#### *Impact of Colour Contrast on Consumers Attitudinal Formation*

According to the research from Hassanein and Head (2007), the visual representation of a brand or product also influences consumer attitudes towards a brand. Meanwhile, the results of Flore et al.'s (2005) and Mazaheri et al.'s (2012) studies show that the perception of various visual design elements influence consumer's attitude formation, especially in the context of websites and online shops. Elsewhere, the results of Loken and Ward's (1990) study also indicate that a high degree of congruence within a stimulus positively influences consumer's attitude formation towards a certain object. In general, consumers rate congruent objects more positively in terms of the attitudinal dimension, since such objects tend to meet their expectations and preferences (Bottomley and Doyle, 2006; Moore et al.

(2005) also illustrated the positive impact of congruent advertisements on websites on the attitudinal dimension. Therefore, we assume that visually congruent colours should be perceived by consumers as more harmonious and esthetically appealing, and thus lead to a more positive attitude than visually incongruent colours (Gorn et al., 2004; Schloss and Palmer, 2011). In addition, Meyers-Levy and Peracchio (1995) also showed that different individual colours used in an advertisement differ in their degree of consumer's attention, perception and evaluation, which is reflected in differences in consumer attitudes towards the advertised product. Elsewhere, Moore et al. (2005) and Noiwan and Norcio (2006) also reported different effects of single colours on consumer behaviour. For example, red is often associated with excitement, while blue triggers associations of trust, competence, and sophistication, which in turn will be reflected in various effects of the attitudinal dimensions (Labrecque and Milne, 2012). Based on the above discussion, we assume the following hypotheses:

- H3a:** An analogous colour contrast (vs. a complementary colour contrast) will positively (vs. negatively) influence consumer attitudes towards a brand.
- H3b:** The predominant primary colour within the visual appearance of a brand will influence consumer attitudes towards a brand.

#### *Impact of Colour Contrast on Consumer's Trust*

Research has shown that the level of trust is linked to variations of willingness to buy the product (Jarvenpaa et al., 2000; Gefen et al., 2003) and willingness to interact with the company (Bhattacharjee, 2002). In both cases, positive correlations were found between the level of trust and consumer behaviour. This relationship is especially important for websites, as they have a limited number of touchpoints with their consumers due to the absence of physical contact (Lynch et al., 2001) and are confronted with a large number of online competitors. Therefore, the perceived level of trust toward any given websites can be the most influential factor in terms of whether a consumer interacts with its website (Harris and Goode, 2004). In addition, Chen and Dibb (2010) showed that the visual design of a website actually has a significant impact on its usability. The esthetic appeal correlates strongly and positively with the perceived quality of the website, which has a direct impact on the level of trust towards a brand and has a positive impact on consumer behaviour. The results of the study by Lee and Rao (2010) confirm these relationships. Here, the manipulation of colours changed the website atmosphere, which significantly influenced the level of trust towards a brand. Once again, this variable correlated positively with consumer behaviour. So, if it is possible to influence the level of trust toward a brand due to its visual

appearance, the principles of colour harmony should apply here as well. Therefore, we argue that an analogous colour contrast will positively influence the perceived colour harmony and the esthetic appeal of a brand and subsequently have a positive effect on consumer's level of trust towards a brand. However, based on the findings of Lee and Rao's (2010) study, the level of trust towards a brand may also change due to the manipulation of the predominant primary colour. Based on the above discussion, we hypothesize the following:

- H4a:** An analogous colour contrast (vs. a complementary colour contrast) will positively (vs. negatively) influence consumer's level of trust toward a brand.
- H4b:** The predominant primary colour within the visual appearance of a brand will influence consumer's level of trust toward a brand.

#### *Impact of Colour Contrast on Consumer's Change in Behaviour*

Bellizzi and Hite (1992) and Lichtlé (2007) confirmed that colours attract consumers since they have specific perceptual qualities that influence consumer behaviour. Colours seem to trigger the esthetic appeal of the product, which is subjectively perceived and evaluated by consumers. Meanwhile, Bagchi and Cheema (2013) had already shown that the targeted use of colours not only increases the purchase likelihood but also results in a higher willingness to pay for products and services. Although these dimensions are among the most important monetary success drivers (Belizze and Hite, 1992), research also has highlighted other non-monetary success factors for online websites. For example, on social media platforms, consumers can click on banner advertisements, subscribe to a channel and share product information with other consumers, thus creating word-of-mouth advertising (Fortin and Dholakia 2005). According to Lothia et al. (2003), the use of colours can increase the click-through rate for banner advertisements, which might lead to further purchases. Furthermore, Fortin and Dholakia (2005) also showed that these interactive possibilities have the ability to favorably impact consumer behaviour. Their findings indicate that interactions with website elements, in general, are highly dependent on the visual design of the website in terms of colours, graphics and animations. Therefore, we argue that, with regard to the basic assumption of the congruence theory (Osgood and Tannenbaum 1955), an analogous colour contrast between different design elements also positively influences consumer behaviour. In addition, based on previous research, we assume that it would also be possible to detect an effect of the predominantly primary colour on consumer behaviour. Based on this discussion, we propose the following hypotheses:

**H5a:** An analogous colour contrast (vs. a complementary colour contrast) will positively (vs. negatively) influence consumer behaviour.

**H5b:** The predominant primary colour will influence consumer behaviour.

#### *The Mediating Impact of Emotion on Consumers Response*

Holbrook and Batra (1987) investigated the mediating influence of emotions on the relationship between stimulus and response. Their results show that consumer's emotional responses act as important mediators for the impact of advertising and consumer attitudes towards the brand. If consumer's experience positive emotions while exposed to the visual representation of the brand (e.g., the company logo, advertisements or the website), this will likely have a positive impact on consumer behaviour. Indeed, within the context of online and offline shop environments, the existing literature shows that the experienced emotions tend to explain consumer behaviour (Eroglu et al., 2001; Menon and Kahn, 2002). Furthermore, Eroglu et al. (2003) showed that the joy and excitement associated with specific design elements within online environments have a positive impact on consumer behaviour. According to Menon and Kahn (2002) the characteristics of products and websites significantly affect the enjoyment and arousal that predict consumer behaviour. In turn, Lu et al. (2012) also investigated the effects of negative emotions on consumer behaviour. Their findings show that the experienced negative emotions are an important mediator in the relationship between dissatisfaction and repurchase intention within the context of online shopping. Based on these findings, we can further hypothesize that an analogous colour contrast is perceived as more harmonious and more esthetically appealing than a complementary colour contrast. In turn, the analogous colour contrast creates positive emotions, which mediate consumer behaviour. Therefore, we assume:

**H6:** The experienced emotions mediate the hypothesized relationships between colour contrast and consumer behaviour.

### **3.3.3 Empirical Overview**

We used a set of five experiments to test our hypotheses, each with a  $2 \times 3$  between-subject design. First, we manipulated the colour contrast between the object's predominant primary colour (yellow, red, or blue) and the minor secondary colour. We manipulated the colour contrast based on the previously introduced Itten (1973) definition of analogous and complementary colour contrast. We used Adobe CC for colour manipulation, an application that allows



consumers to create various colour schemes (analogous or complementary). Using this application, we created six different variations for each object according to our experimental design. In the context of our studies, a colour is defined as predominant if it exceeds a critical threshold of 50% on average in relation to the total number of pixels of the object. The first study exposed the participants to a new consulting agency's company logo, manipulated according to our research design. We chose this example for the first study to ensure consumer neutrality toward the logo, as the logo of a well-known brand might distort the level of consumer awareness and therefore the data. In addition, this study aimed to demonstrate the fundamental effect of colour contrast on the perception of colour harmony and esthetic appeal. Therefore, the study's results address the assumptions of H1a and H1b. Furthermore, we manipulated the photos of a mobile phone provider's Instagram account for the second study. We manipulated this Instagram account so that the photos of the presented products produced the required colour contrasts (analogous vs. complementary). The participants examined a single manipulation and were subsequently questioned about their emotional reaction, attitude, and level of trust toward the provider. The results relate to H2a, H2b, H3a, H3b, H4a, and H4b. Video games comprise the most successful app category found in app stores. Therefore, we decided to use this app category for the experimental settings in the third study. We developed a mobile video game containing a banner advertisement. The graphics of the video game also generated a specific colour contrast relative to the banner advertisement. During this experiment, we asked the participants to play the video game and also gave them a chance to close the banner advertisement during play. Thus, this experiment's results partially address aspects of H5 and H5b. In the fourth study, we gave the participants the task of evaluating a brand online. Specifically, they watched and evaluated a YouTube video, manipulated according to our research design. Here, we asked the participants within the experimental groups to make a statement relating to whether they would subscribe to the YouTube channel and "like", "comment", or "share" the video. The results relate to the influence of colour contrast on non-monetary success drivers in the sense of H5a and H5b. Due to the increasing importance of online shops (as a sales channel) for retailers, we manipulated the colours of an online shop in the fifth experiment. Our online shop contained a section introducing a new clothing collection. The colours used in this section generated an analogous or complementary colour contrast to the remaining colours of the website. We asked the participants if they would be willing to buy something from this online shop and how much they would pay for the presented products. The results address the monetary success drivers of H5a and H5b and the mediating effects assumed in H6. Finally, we used a

subsample of the participants from the fifth experiment and examined their eye movements using eye-tracking glasses. Here, we investigated the duration and number of eye fixations within the settings to make statements regarding unconscious behavioural changes. We asked each participant from all studies if they had ever been diagnosed with colour blindness. If so, they could not join the experiment. Furthermore, they needed to own at least one mobile device. These conditions ensured that the participants could recognize the colour contrasts (from a medical point of view), and they had a minimum level of interest in digital products and mobile devices. In addition, we used only complete datasets for the calculations. Generally, these limitations reduced the respective net sample of the surveyed participants by 25% (Table 3.11).

#### *Study 1 with the Use Case: Logo of a Company*

181 participants (69,6% female) joined a 2×3 between-subject experiment. The participants were randomly assigned to one of the six experimental conditions. Within an experimental group, the participants were presented with exactly one manipulated company logo of an unknown consulting agency. The manipulation of the logo is illustrated in Figure 3.4. Based on the visual impression, the participants were asked to evaluate the perceived colour harmony as well as the esthetic appeal of the logo.

The colour harmony was measured by using the bipolar adjectives of the semantic differential introduced by Schloss and Palmer (2011) on a seven-point scale (3 items, e.g., 1 = disharmonious—7 = harmonious, Cronbach's  $\alpha = .90$ ). The esthetic appeal of the logo was operationalized according to the semantic differential of Wang et al. (2011) using a seven-point scale (4 items, e.g., 1 = unappealing—7 = appealing, Cronbach's  $\alpha = .85$ ). To avoid potential bias from ordering effects, we randomized the scales and the items in the online questionnaire. As we were mainly interested in the impact of the colour contrast and in the influence of the predominant primary colour within the experimental conditions, the participants' responses were mean aggregated and were used as dependent variables in the data analysis. According to Perdue and Summers (1986), ANOVA tests were conducted to check whether the intended manipulation of the colour contrast, in terms of an analogous colour contrast vs. a complementary colour contrast, was successful. As expected, the results indicate that a company logo with an analogous colour contrast gets perceived as more harmonious as well as more esthetically appealing, compared to a company logo with a complementary colour contrast (colour harmony:  $M_{\text{analogous}} = 5.08$  (1.5),  $M_{\text{complementary}} = 4.36$  (1.8),  $F(1, 175) = 8.11$ ,  $p < .01$ ; esthetic appeal:  $M_{\text{analogous}} = 3.78$  (1.5),  $M_{\text{complementary}} = 3.22$  (1.3);  $F(1, 175) = 7.60$ ,  $p < .01$ ), but not affected by the

**Table 3.11** Overview of the constructs and item used in the upcoming studies

<b>Constructs (Cronbach's Alpha)</b>	<b>Items</b>	<b>Sources</b>
<b>Colour Harmony</b> ( $\alpha = .90$ )	disharmonious / harmonious disharmonious in hue / harmonious in hue disharmonious in lightness / harmonious in in lightness	Adapted from Schloss and Palmer (2011)
<b>Esthetic Appeal</b> ( $\alpha = .85$ )	Informality / formality unappealing / appealing unfulfilled/ fulfilled unpleasant / pleasant	Adapted from Wang et al. (2011)
<b>Pleasure</b> ( $\alpha = .88$ )	unhappy / happy melancholic / contented unsatisfied / satisfied annoyed / pleased bored / relaxed	Adapted from the PAD scale by Mehrabian and Russel (1974)
<b>Arousal</b> ( $\alpha = .74$ )	sluggish—frenzied unaroused—aroused relaxes—stimulated calm—exited sleepy—wide awake	Adapted from the PAD scale by Mehrabian and Russel (1974)
<b>Dominance</b> ( $\alpha = .84$ )	controlled—controlling influenced—influential cared for—in control guided—autonomous submissive—dominant	Adapted from the PAD scale by Mehrabian and Russel (1974)
<b>Consumer attitudes towards a brand</b> ( $\alpha = .96$ )	unattractive / attractive not desirable / desirable uninteresting / interesting bad / good	Adapted from Stuart at al. (1987)
<b>Perceived trust towards the brand</b> ( $\alpha = .90$ )	The brand is trustworthy. I trust that the brand would act to my advantage. The brand would keep promises to me. I would trust in the information that the brand gives me. The online retailer strives to be known for keeping its promises.	Adapted from Doney and Cannon (1997) and Jarvenpaa et al. (2000) and Koufaris and Hampton-Sosa (2004)

(continued)

**Table 3.11** (continued)

Constructs (Cronbach's Alpha)	Items	Sources
<b>Intention to Like</b>	I would bookmark this video with a "Like".	Adapted from Bart et al. (2005)
<b>Intention to leave a comment</b>	I am comfortable to share my opinion as a comment on this video.	Adapted from Bart et al. (2005)
<b>Intention to Share</b>	I would recommend this YouTube Channel to a friend.	Adapted from Bart et al. (2005)
<b>Intention to Subscribe</b>	I would subscribe this YouTube Channel.	Adapted from Bart et al. (2005)
<b>Purchase intention</b> ( $\alpha = .91$ )	I think it is a good idea to buy the product from the website. I am positive about buying the product from the website. I think it is unwise to support the online retailer by buying from it.	Adapted from Laczniak et al. (2001)

**Figure 3.4** Example of the Logo

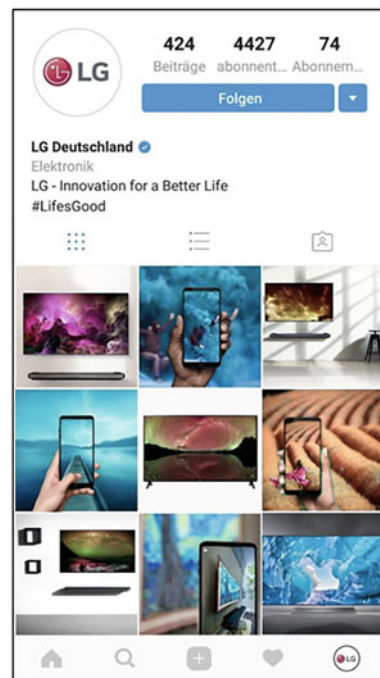
predominant primary colour (colour harmony:  $M_{\text{yellow}} = 4.86$  (1.7),  $M_{\text{red}} = 4.50$  (1.8),  $M_{\text{blue}} = 4.85$  (1.6),  $F(2, 175) = 0.90$ , n.s.; esthetic appeal:  $M_{\text{yellow}} = 3.52$  (1.2),  $M_{\text{red}} = 3.23$  (1.8),  $M_{\text{blue}} = 3.78$  (1.5),  $F(2, 175) = 1.83$ , n.s.). The ANOVA tests with perceived colour harmony and esthetic appeal as dependent variables show no significant interaction effect between the experimental factors. Overall, the findings above provide empirical evidence for a successful manipulation due to our research design and support our hypothesis H1a and H1b. The logo of an unknown consulting agency with an analogous colour contrast is perceived as more harmonious and esthetically appealing compared to a logo

with a complementary colour contrast. Furthermore, this effect is independent of the predominant primary colour of the logo. The aim of the next study is to investigate whether this effect can be replicated and has an impact on consumer's emotional response and their attitude and level of trust towards a brand.

### *Study 2 with the Use Case: Social Networks*

After the data cleaning we include 178 remaining datasets (65,2% female) in the second study. Again, as part of a 2×3 between-subject experiment, the participants were randomly assigned to one of the six experimental conditions. This time we manipulated the used colours of the product photos within an Instagram account of a mobile device manufacturer (Figure 3.5). For a few minutes, each participant had to take a look at exactly one manipulation. Afterward, the subjects were asked about their emotional response, their attitude and level of trust towards the mobile phone seller.

**Figure 3.5** Example of the Instagram account



We used the established PAD scale by Mehrabian and Russel (1974) to measure the participants' emotional responses on the three dimensions pleasure (5 items, e.g., 1 = unhappy—7 = happy, Cronbach's  $\alpha = .88$ ), arousal (5 items, e.g., 1 = calm—7 = excited, Cronbach's  $\alpha = .74$ ), and dominance (5 items, e.g., 1 = controlled—7 = controlling, Cronbach's  $\alpha = .84$ ) using the bipolar adjectives of the semantic differentials. To measure the consumer attitudes towards the mobile phone seller we adapted the bipolar adjectives of the semantic differential scale of Stuart et al. (1987) (4 items, e.g., 1 = dislike the company—7 = like the company, Cronbach's  $\alpha = .96$ ). Furthermore, we used bipolar adjectives of the semantic differential trust scale of Bart et al. (2005) to the context of our study (5 items, e.g., 1 = untrustworthy—7 = trustworthy, Cronbach's  $\alpha = .90$ ). In order to avoid possible bias due to order effects, we again randomized the scales and items in the online questionnaire. The results show a significant main effect of the colour contrast on each of the emotional dimensions. Pleasure, arousal, and dominance were positively affected by an analogous colour contrast between the different photos of an Instagram account (pleasure:  $M_{\text{analogous}} = 4.87$  (0.9),  $M_{\text{complementary}} = 4.28$  (0.9),  $F(1, 172) = 19.04$ ,  $p < .01$ ,  $\eta^2 = .10$ ; arousal:  $M_{\text{analogous}} = 4.17$  (0.9),  $M_{\text{complementary}} = 3.72$  (0.8),  $F(1, 172) = 10.538$ ,  $p < .01$ ,  $\eta^2 = .058$ ; dominance:  $M_{\text{analogous}} = 4.29$  (SD = 0.8),  $M_{\text{complementary}} = 4.03$  (0.8),  $F(1, 172) = 4.813$ ,  $p < .05$ ,  $\eta^2 = .027$ ). Hence, we obtained empirical support for H2a.

Interestingly, the findings did not show a significant main effect of the predominant primary colour on all emotional dimensions, not supporting H2b. Moreover, the findings show no significant interaction effect between the colour contrast and the predominant primary colour on the emotional dimensions. Therefore, the potential influence of a single colour, known from literature (e.g., Valdez and Mehrabian 1994; Labrecque and Milne 2012) seems to be neutralized by the significant effect of the colour contrast. In H3a and H3b, we also proposed that the colour contrast and the predominant primary colour influence consumer attitudes towards a brand or in the context of this experiment, the mobile phone seller. The results of one ANOVA show that this attitudinal dimension was influenced by the colour contrast. An analogous colour contrast (between the photos of the Instagram account) has a positive impact on the attitudinal dimension ( $M_{\text{analogous}} = 5.10$  (1.3),  $M_{\text{complementary}} = 4.18$  (1.5),  $F(1, 172) = 21.28$ ,  $p < .01$ ,  $\eta^2 = .11$ ). Overall, this finding supports H3a. Again, and contrary to our expectations, we obtained no empirical evidence for the impact of the predominant primary colour on this dimension and therefore not supporting H3b. Moreover, no significant interaction effect between colour contrast and the predominant primary colour on consumer attitudes towards a brand could be identified. In H4a and H4b we also

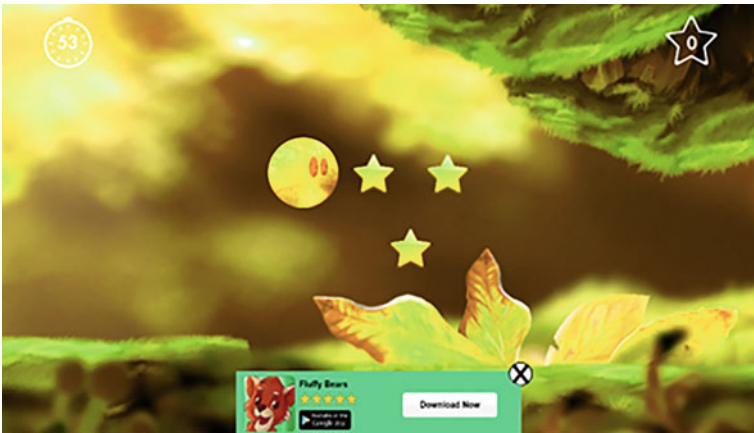
assumed that the colour contrast has an influence on the level of trust towards a brand or in the context of this experiment, the mobile phone seller. Therefore, an analogous colour contrast should positively affect this dependent variable. Again, we performed an ANOVA to analyze our data. The results show that an analogous colour contrast actually has a positive influence on the level of trust towards a brand ( $M_{\text{analogous}} = 4.43$  (1.2),  $M_{\text{complementary}} = 3.90$  (1.2),  $F(1, 172) = 9.36$ ,  $p < .01$ ,  $\eta^2 = .052$ ). On the one hand, these findings support H4a. On the other hand, we could not find confirmation for H4b. However, a significant interaction effect occurred. A combination of an analogous colour contrast with the predominant primary colour blue led to a particularly high increase of the level of trust towards a brand ( $M_{\text{analogous} \times \text{blue}} = 4.51$  (1.3),  $F(2, 172) = 3.56$ ,  $p < .05$ ,  $\eta^2 = .04$ ). In part, our findings support the findings of Labreque and Milne (2012). The colour blue actually triggers associations of trust, competence, and sophistication in the minds of the consumers. This effect remains if blue appears within an analogous colour contrast.

This second experiment was able to replicate the positive effects of an analogous colour contrast on the perceived colour harmony and esthetic appeal (colour harmony:  $M_{\text{analogous}} = 5.86$  (1.2),  $M_{\text{complementary}} = 4.75$  (1.7),  $F(1, 172) = 31.88$ ,  $p < .01$ ; esthetic appeal:  $M_{\text{analogous}} = 5.65$  (1.2),  $M_{\text{complementary}} = 4.82$  (1.5);  $F(1, 172) = 22.41$ ,  $p < .01$ ). In addition, our results also provide insights about a similar positive effect on several consumer-related variables like consumer experienced emotions as well as consumer attitudes and level of trust towards a brand. Interestingly, these effects are mostly detached from the predominant primary colour. The third study focuses on whether this manipulation also has an impact on the actual consumer behaviour, as assumed in H5a and H5b.

### *Study 3 with the Use Case: Video games*

In the third study, we manipulated a new video game for a mobile tablet. In cooperation with an app developer, we uniformly coloured all graphic elements in shades of yellow, red or blue. Furthermore, a banner advertisement was placed at the bottom of the screen. A similar video game was advertised in the banner ad, which also featured a child-friendly video game from the same developer, to ensure a high degree of content congruence between the video game itself and the banner advertisement, based on the findings of Shen and Chen (2007). In terms of colour, the banner advertising was manipulated according to our research design, it creates either an analogous or a complementary colour contrast to the graphics of the video game itself. Again, the settings with an analogous color contrast are getting perceived as more harmonious and esthetical appealing (colour harmony:  $M_{\text{analogous}} = 5.10$  (1.1),  $M_{\text{complementary}} = 4.68$  (1.6),  $F(1, 174) = 4.20$ ,  $p < .05$ ;

esthetic appeal:  $M_{\text{analogous}} = 4.14$  (1.4),  $M_{\text{complementary}} = 3.89$  (1.5);  $F(1, 174) = 6.37$ ,  $p < .05$ ). A screenshot of each manipulation is illustrated in Figure 3.6. We asked 180 undergraduates (63,3% female) to play one of the six manipulations for two rounds. One round corresponded to the playtime of exactly 60 seconds. During this time the participants were able to close the displayed banner advertisement, which appeared again after 30 seconds. On a web server, the data for each participant were stored unnoticeable during the playtime: the number of banner advertisement closures and how many seconds the banner advertisement was displayed.



**Figure 3.6** Example of the video game

After the playtime, the participants were interviewed regarding their emotional response, attitude, and level of trust towards the video game developer. Furthermore, they were also asked on a nominal scale (1 = yes or 0 = no), if they could recall the name or recognized the icon of the advertised video game. As all participants are hand-picked, we made sure that they all completed the questionnaire. The banner advertisement with a complementary colour contrast was getting closed more frequently in the first round ( $M_{\text{analogous}} = 0.12$  (0.3),  $M_{\text{complementary}} = 0.56$  (0.9),  $F(1,174) = 15.83$ ,  $p < .01$ ,  $\eta^2 = .083$ ). As a result, such a banner advertisement was displayed for a shorter period of time ( $M_{\text{analogous}} = 86.39$  (19.6),  $M_{\text{complementary}} = 76.30$  (24.0),  $F(1,174) = 13.56$ ,  $p < .01$ ,  $\eta^2 = .072$ ). The findings could also be replicated during the second round. Again, the banner advertisement within a complementary colour contrast setting was getting



closed more frequently ( $M_{\text{analogous}} = 0.12 (0.45)$ ,  $M_{\text{complementary}} = 4.11 (0.8)$ ,  $F(1,174) = 8.58$ ,  $p < .01$ ,  $\eta^2 = .047$ ) and was displayed for a shorter period of time ( $M_{\text{analogous}} = 87.00 (9.2)$ ,  $M_{\text{complementary}} = 79.27 (23.4)$ ,  $F(1,174) = 10.93$ ,  $p < .01$ ,  $\eta^2 = .059$ ). However, the predominant primary colour had no influence on the behaviour of the participants. There was also no interaction effect between the colour contrast and the predominant primary colour. The analysis of a Chi-Square analysis also showed that there was no significant impact of the colour contrast or predominant primary colour on the dependent variables recall and recognition. Our results indicate that the colour contrast within an object leads to a behavioural change. Due to the colour disharmony within a complementary setting participant felt a need to close the banner advertisement more frequently. Therefore, advertisers should be aware of the impact of a congruent visual design on consumer behaviour. Based on our findings a complementary colour contrast is always unsuitable. The fourth study will now investigate whether the colour contrast also has an influence on non-monetary success drivers, as assumed in H5a.

#### *Study 4 with the Use Case: Streaming Services*

Social networks offer consumers the opportunity to interact with brands and like, subscribe, share and comment on the respective brand account. These factors are not direct monetary success drivers, as these interactions are leading to a relationship with the brand, which can lead to downstream purchases (Fortin and Dholakia 2005; Lin and Lu 2011; Vries et al. 2012). So, in this study, we manipulated the colours of a video on a YouTube channel, according to our research design. The video was an explanatory movie using only animated geometric shapes and text elements. These abstract forms are particularly suitable for the experiment, as the colors could be freely manipulated without distorting the context of the video. The manipulation was done with the software After Effects. Therefore, the colours used within the video create either an analogous or complementary colour contrast, illustrated in Figure 3.7. We asked 189 participants (52,9% female) to watch the video of exactly one manipulation and then complete a questionnaire.

Again, the questionnaire contains questions regarding the perceived colour harmony and esthetic appeal. Furthermore, the participants were asked whether or not they would like, share, subscribe the YouTube channel and the intention to leave a comment on the video, using a seven-point Likert scale (1 = Not at all, 7 = Definitely), based on the scales by Bart et al. (2005). Once again, the effects of the colour contrast on the manipulation variables from the previous experiments could be replicated (colour harmony:  $M_{\text{analogous}} = 4.34 (2.0)$ ,



**Figure 3.7** Example of the YouTube video

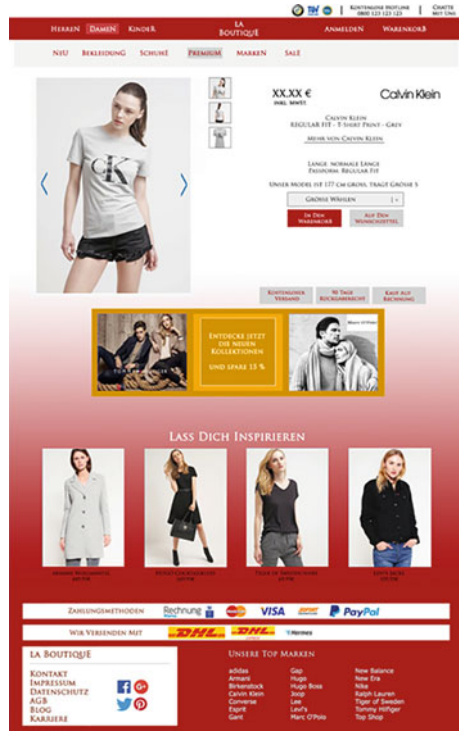
$M_{\text{complementary}} = 3.73$  (1.9),  $F(1, 183) = 4.23$ ,  $p < .05$ ; esthetic appeal:  $M_{\text{analogous}} = 4.01$  (1.9),  $M_{\text{complementary}} = 3.39$  (1.6);  $F(1, 183) = 6.89$ ,  $p < .01$ ). Furthermore several ANOVAs also reveal an impact on the stated behavioural intentions of the participants (intention to like the YouTube channel:  $M_{\text{analogous}} = 3.04$  (2.1),  $M_{\text{complementary}} = 2.36$  (1.8),  $F(1, 183) = 5.74$ ,  $p < .05$ ,  $\eta^2 = .038$ ; intention to share the YouTube channel:  $M_{\text{analogous}} = 2.81$  (1.8),  $M_{\text{complementary}} = 2.26$  (1.4),  $F(1, 183) = 5.29$ ,  $p < .05$ ,  $\eta^2 = .028$ ; intention to subscribe the YouTube:  $M_{\text{analogous}} = 2.89$  (2.1),  $M_{\text{complementary}} = 2.38$  (1.8),  $F(1, 183) = 2.98$ ,  $p < .1$ ,  $\eta^2 = .016$ ; intention to leave a comment on the video:  $M_{\text{analogous}} = 2.26$  (SD = 1.9),  $M_{\text{complementary}} = 1.62$  (1.0),  $F(1, 183) = 9.09$ ,  $p < .01$ ,  $\eta^2 = .047$ ).

Hence, we again obtained empirical support for H5a. In addition, the findings again did not show any significant effect of the predominant primary colour and therefore did not support H5b. Moreover, the results do not show any significant interaction effect between the colour contrast and the predominant primary colour on the emotional dimensions. An analogous colour contrast within the online presence of a brand on a social media channel, respectively YouTube channel influence positively non-monetary success factors and thus indirectly improve consumer loyalty to the brand. In the next study, with regard to Hypothesis 5a and 5b, we examined whether or not an analogous colour contrast of an online shop also has a positive effect on monetary success drivers, such as the willingness to buy and the willingness to pay. In the next study, we investigate the mediating influence of consumer's emotional responses on the relationship between the colour contrast on consumer behaviour.

*Study 5 with the Use Case: Webstores*

In the fifth study, we manipulated the colours of a fictitious online shop. Apart from the products, various graphic elements were uniformly coloured in shades of yellow, red or blue. In addition, a new clothing collection was advertised at the bottom of the online shop. This element was coloured in shades of orange, purple or green. According to our research design, these colour combinations produce either an analogous or complementary colour contrast. In addition, the displayed products have been adapted to gender-specific requirements. Female participants in the experiment only saw women's clothing and male participants were only confronted with men's clothing. An example of the manipulation is illustrated in Figure 3.8. We assume that a complementary colour contrast worsens the appearance of the online shop and thus the willingness to buy and pay.

**Figure 3.8** Example of the online shop



The 262 participants (74% female) got the task, to study exactly one manipulation carefully. After a few instructions and exposure to the scenario participants were interviewed towards several consumer-related dependent variables, similar to the scales used in the previous experiments. The effects of the manipulation variables are consistent once again (colour harmony:  $M_{\text{analogous}} = 3.64$  (1.7),  $M_{\text{complementary}} = 3.25$  (1.7),  $F(1, 256) = 4.02$ ,  $p < .05$ ; esthetic appeal:  $M_{\text{analogous}} = 4.10$  (1.3),  $M_{\text{complementary}} = 3.67$  (1.3);  $F(1, 256) = 5.93$ ,  $p < .05$ ). The measurement for the willingness to buy from the online shop was adapted from Bart et al. (2005) and adjusted to fit this specific context. Specifically, participants should evaluate 3 items, e.g., “I think it is a good idea to buy the product from the website.” on a seven-point Likert scale (1 = Not at all, 7 = Definitely, Cronbach’s  $\alpha = .91$ ). Furthermore, they were asked to state the price they would be willing to pay, for the presented product. In addition, several ANOVAs were conducted and indicating an influence of the colour contrast on the monetary success factors. The willingness to buy was significantly higher among the participants with an analogous colour contrast setting (willingness to buy:  $M_{\text{analogous}} = 3.18$  (1.5),  $M_{\text{complementary}} = 2.74$  (1.4),  $F(1, 256) = 6.28$ ,  $p < .05$ ,  $\eta^2 = .024$ ). In addition, even the willingness to pay for the presented product increased by an average of almost 35% (willingness to pay:  $M_{\text{analogous}} = 10.61$  (16.4),  $M_{\text{complementary}} = 6.96$  (12.9),  $F(1, 256) = 4.16$ ,  $p < .05$ ,  $\eta^2 = .016$ ). Hence, we again obtained empirical support for H5a, but not support H5b. Furthermore, the results do not show any significant interaction effect between the experimental factors. In H6 we assume that the analogous colour contrast enhance positively consumer’s emotional response and therefore mediating the effect of the colour contrast on the monetary success drivers. To test our hypothesis, several bootstrap estimations (PROCESS model 4; Hayes 2013) were conducted with colour contrast as the independent variable, willingness to buy and willingness to pay as the dependent variable, and the 3 emotional dimensions (namely pleasure, arousal and dominance) as the mediators. The indirect effect of pleasure on the willingness to buy was significant ( $B = .92$ ,  $SE = .07$ ; 95% CI = .76, 1.07), indicating mediation, whereas the direct effect became nonsignificant ( $B = -.18$ ,  $SE = .15$ ; 95% CI =  $-.47$ , .11). Furthermore, the indirect effect of arousal on the willingness to buy was significant ( $B = .73$ ,  $SE = .09$ ; 95% CI = .55, .91), indicating mediation, whereas the direct effect became nonsignificant ( $B = -.27$ ,  $SE = .16$ ; 95% CI =  $-.58$ , .05). However, the indirect effect of dominance on the willingness to buy was not significant. A similar approach was conducted with the willingness to pay as the dependent variable. The indirect effect of pleasure on the willingness to pay was significant ( $B = 4.38$ ,  $SE = .94$ ; 95% CI = 2.54, 6.22), indicating mediation, whereas the direct effect became nonsignificant ( $B = -2.39$ ,  $SE =$

1.77; 95% CI = -5.88, 1.11). Furthermore, the indirect effect of arousal on the willingness to pay was significant ( $B = 3.51$ ,  $SE = 1.00$ ; 95% CI = 1.55, 5.49), indicating mediation, whereas the direct effect became nonsignificant ( $B = -2.80$ ,  $SE = 1.80$ ; 95% CI = -6.35, .75). Once again, there was not a mediating impact of the dimension dominance. Therefore, our results partially support H6. Additionally, the results from study 5 illustrated the full mediational pathway from the colour contrast to the willingness to buy and willingness to pay via the emotional dimensions of pleasure and arousal. The result provided evidence for the novel effect of the colour contrast on these monetary success drivers and illustrated the underlying mediating process of consumer's emotional response.

### *Subsample of Study 5*

To gain further insight how consumers perceive and cognitively process colours and colour contrasts, we also conducted an eye tracking experiment with a subsample of study 5 with the same six manipulations, according to our research design. Therefore, fifty-two students (75% female) participated on a voluntary basis. The experiment was performed in a small laboratory without any kind of distraction. In the beginning, the participants were equipped with the SMI mobile eye tracking glasses by the researcher. These SMI mobile eye tracking glasses require a calibration that took about 30 seconds and was performed for each participant. After the calibration, the participant should study the online shop for exactly one minute carefully. Exactly this time span was recorded and evaluated concerning the Eye-Fixations. In our experiment on Eye-fixation is considered to occur when eyes are fixed stably for 100 milliseconds. In particular, we analyze the entry-time, fixation count and the retention period of the eyes towards the new cloth collection which was advertised at the bottom of the online shop. This object either generate an analogous or complementary colour contrast according to our research design. As expected, an evaluation of the recordings from the SMI mobile through several ANOVAs revealed, that the object was fixed in a complementary setting for the first time 6 seconds later compared to an analogous setting (entry time:  $M_{\text{analogous}} = 9.59$  (7.8),  $M_{\text{complementary}} = 15.37$  (11.9),  $F(1, 46) = 4.39$ ,  $p < .05$ ,  $\eta^2 = .087$ ). Furthermore, the fixation count was also higher within an analogous setting (fixation count:  $M_{\text{analogous}} = 30.38$  (16.2),  $M_{\text{complementary}} = 21.77$  (10.8),  $F(1, 46) = 4.18$ ,  $p < .05$ ,  $\eta^2 = .083$ ). Finally, within an analogous setting, the retention period was also about 3 seconds longer compared to a complementary setting (retention period:  $M_{\text{analogous}} = 9.23$  (6.2),  $M_{\text{complementary}} = 6.16$  (3.1),  $F(1, 46) = 4.36$ ,  $p < .05$ ,  $\eta^2 = .087$ ). Our findings suggest that the participants tend to avoid the manipulated object within a complementary setting.

### 3.3.4 Discussion

The basic idea of our research design was that an analogous contrast of an object would positively influence the perceived colour harmony, esthetic appeal, consumer's emotional response, consumer attitudes and level of trust towards a brand as well as consumer behaviour. Moreover, we proposed that the predominant primary colour of an object influences the consumer-related outcome variables as well. We were able to show that an analogous colour contrast is getting perceived indeed as more harmonious and esthetically appealing. Furthermore, such a contrast has a positive direct effect on the emotional dimensions of pleasure, arousal, and dominance. Furthermore, using an analogous colour contrast positively influences consumer attitude and level of trust towards a brand. At least in our research settings, the results of the presented studies further indicate that using an analogous colour contrast within an object positively influence consumer behaviour, partly mediated by consumer's emotional response. In this context, the findings of the present studies are in line with the results of Gorn et al. (1997) as well as Schloss and Palmer (2011), which have also shown that combinations of similar, congruent colours within a stimulus result in positive consumer-related responses. Contrary to our expectations, the findings of our experimental studies did not support our assumption that the outcome variables under investigation should be influenced by the predominant primary colour of the object. We even analyzed whether or not the personal favorite colour of the participants had an impact on our dependent variables. Also, such an experimental factor had no significant effect. This result indicates that colour contrasts might diminish the effects of single colours on consumer perceptions and evaluations as well as on their intentional behaviour, which have been identified in previous studies.

According to Miniard et al. (1991), one might conclude that involvement towards the product category might act as a moderator of the strength of the relationship between experimental factors and the consumer-related outcome variables under study. The operationalization of involvement towards the product category as a potential moderating effect is often applied in empirical research (Eroglu et al. 2001; Petty et al. 1983; Miniard et al. 1991). Involvement is of relevance for a consumer's information processing and the degree of cognitive elaboration and the persuasive impact of the processed information (Celsi and Olson 1988; Petty and Cacioppo 1986; Swinyard 1993). Hence, we controlled for the potential moderating impact of involvement within each experiment through additional analysis using moderated regression as suggested by Baron and Kenny (1986). However, we never identified a moderating impact between the experimental factors and the dependent variables of our studies. However, the identified

positive direct effects of an analogous colour contrast on the constructs under investigation are an interesting result for consumer research. Thereby, our results provide insights into the perception of a brand and company. Our results have important implications for future research on the impact of colour combinations on consumer behaviour, which are related to the limitations of the present study.

In general, colours are described by specific attributes, namely hue, saturation, and lightness and the impact of colour on consumer perceptions and evaluations differs according to the design of these elements (Labrecque and Milne 2012). In our studies, we only manipulated the colour hue of the predominant primary. Hence, future research should also consider the impact of a manipulation of the other colour attributes on consumer responses. Further information about the company (e.g., reviews, brand awareness) will certainly also affect consumer behaviour. Hence, future research should deal with this fact by investigating the impact of these different aspects and their interdependencies on consumer-related outcome variables. Last but not least, prior research in personality and consumer behaviour shows several important differences in personalities with respect to demographic variables (e.g., age, culture, and education) and differences in general consumer behaviour between countries. Furthermore, previous research on the impact of colours on consumer behaviour has shown that consumers with different cultural backgrounds are supposed to have different associations and preferences for specific colours (Aslam 2006). This potentially might result in differences regarding, e.g., consumer attitude formation and behaviour (Block and Kramer 2009). In follow-up research, this and the previously mentioned issues should be addressed. Marketers can consider the findings of our studies to better attract consumers due to a visually appealing brand design. Our results show that an analogous colour contrast could positively influence several consumer related outcomes. The experiments involve several touchpoints that consumers may have with a brand. Our results confirm that the visual appearance of a brand certainly plays an important role in shaping the perception and evaluation of a brand by consumers and triggers certain associations. Therefore, colours are an effective communication tool. Furthermore, our findings suggest that an analogous colour contrast should always be preferred by marketers. Based on our data, there is no advisable constellation to use a complementary colour contrast. A complementary colour contrast does not positively influence the emotional response of consumers, their attitudes or purchasing behaviour in any way. Moreover, a complementary colour contrast also does not lead to an increased attention towards the brand. As a result of the eye tracking experiment, participants tend to avoid the object with a complementary colour contrast, since they unconsciously tend to look at the object less often. Interestingly, all effects are usually detached from

the predominant primary colour of the object. The findings of earlier research (Gorn et al., 1997, Valdez and Mehrabian 1994, Bottomley and Doyle 2006, Elliot et al., 2007, Metha and Zhu 2009) certainly provide exciting insights about the influence of a single colour in a unicoloured environment (e.g., red leads to higher excitation and blue is usually associated with competence).

However, as soon as the brand appears with a secondary colour, the effect of the individual primary colour is completely neutralized by the colour contrast. Therefore, marketers should consider the results of our studies and use an analogous colour contrast more frequently for the brand design. Nevertheless, the effects of the experimental factors on consumer related outcome variables might also be influenced by culture (e.g., Cyr et al. 2009). In the context of website design, the findings reveal that website colour appeal is a significant determinant for website trust and satisfaction with differences noted across cultures. Therefore, companies should also be aware of potentially existing cross-cultural differences with regard to the impact of colours and colour combinations.

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### **3.4 The Need for a Community: The Impact of Social Attributes on Video Game Success**

#### **3.4.1 Introduction**

Video games have become very popular: For instance, in the United States video game revenue grew up to \$90.5 billion in 2020. Moreover, two-thirds of all United States citizens are playing video games on a regular basis (Entertainment Software Association, 2021). However, despite their popularity, the success drivers of video games have not yet been sufficiently empirically investigated. This is an important issue for developers, because the production costs of video games also increased enormously due to new hardware technologies and state-of-the-art game mechanics, graphics, and sound effects. For example, the production budget of “Grand Theft Auto V”, is still one of the most successful video games of all time, was around \$250 million (IMDB, 2016). Therefore, developers can be faced with considerable financial risk nowadays if the video game does not become a market success.

To reduce the risk of a low financial results, developers could incorporate paid content through in-app purchases or download content (DLC) so that a consumer can purchase new weapons, items or new characters and update the basic game. Consumers who have a high average playtime in the video game are particularly inclined to purchase such additional features (Han et al., 2016). Taking all that



into account, developers are facing a huge financial risk when developing a new video game. Nevertheless, taking this risk can certainly pay off. Video games that end up being successful can generate more than 300 percent of their original production costs (Clements and Ohashi, 2005). For example, the previously mentioned video game “Grand Theft Auto V” generated about \$800 million in revenue within the first 24 hours of its release (IGN, 2013), as well as over \$6 billion in the following years through in-app purchases and DLC based on a correspondingly long average playtime (Marketwatch, 2018). However, there is high uncertainty among developers regarding which type of video game they should offer, and thus far, success drivers of video games have not been entirely empirically identified.

Gretz (2010) showed that the success of a video game depends on a high number of consumers of a specific video game console, e.g., an Xbox or a PlayStation. Gallagher and Wang (2002) and Schilling (2002), showed that a high number of consumers of a specific video game console had a positive effect on the console’s appeal and the sales volume of the available video games. However, the quality of offered video games is an even more important factor regarding the large number of consumers of a specific video game console (Anderson et al., 2014; Lee, 2013). Additional research focused on content-related features of the individual video game.

Most authors argued that video games are hedonic products (e.g., Lin, 2010; Turel et al., 2010), the quality of which can only be assessed by a consumer after the purchase process. Therefore, video games portray economic risks for new consumers (Voss et al., 2003). To reduce the risk, i.e., the potential failure of the purchase, consumers frequently rely on reviews, price, the reputation of the developer, and the video game genre. Those features could generate a positive expectation towards the gaming experience and thus lead to a purchase intention. Cox (2013) showed that the reputation of the developer and reviews from journalists could be part of these influential features on the expectation. Moreover, his results show that some genres are getting more preferred than others. Furthermore, Binken and Stremersch (2009) showed a direct positive effect of professional reviews on consumers expectation of the product quality and therefore on sales of video games. The reviews even had a disproportionate impact when the video game received an absolute top rating of nearly 100 possible points. Nevertheless, the role of newer features, e.g., multiplayer and social interactions with other consumers while playing the video game, have been ignored as potential success drivers so far. The way video games are consumed by consumers through social media, online forums, and multiplayer features has changed dramatically within the last ten years (Marchand and Hennig-Thurau,

2013). Therefore, not only the product features impact the expectation and satisfaction towards a video game but also social attributes (like discussion threads and reviews) that have formed around a video game. Through new online multiplayer features, in-app purchases and communication channels, consumers have been enabled to update the video game, add new features, and share their passion with people from different countries and continents. Video games are no longer just a product that a consumer buys for a fixed price and enjoys playing on their own or with known friends. Social interaction, knowledge-sharing and lively discussions are essential factors of any online community (Butler, 2001; Wasko and Faraj, 2005) and the video game community thrives on the same principles.

Massively multiplayer online games, e.g., “Dota 2” and “Counter-Strike”, enjoy huge popularity among gamers. With an average overall playtime of over 300 hours (lifetime average playtime per gamer), “Counter-Strike” ranks as one of the most played video games on the digital distribution platform Steam (Steam, 2021). Through their participation, consumers of those video games are not only playing the video game, but are also creators of the gaming experience (Buchanan- Oliver and Seo, 2012). Furthermore, consumers today even enjoy games in a more passive way. Various YouTube channels that produce primarily “Lets-Play” videos can be seen as a direct result of this development. In this video format, a consumer films himself while playing a video game and commenting entertainingly on the video game mechanics. At the same time, other consumers can discuss the video game through chat features or discussion forums (YouTube, 2021).

A similar service is accessible through Twitch, a platform that also offers streaming services. Unlike YouTube, this service is more focused on live broadcasting of given material and is especially popular with gaming streams. Once again, consumers can observe other consumers playing a video game while interacting through implemented chat functions or even play along with the host through online multiplayer features (Twitch, 2021). Ledbetter and Kuznekoff (2011) argued that the perceived utility of those multiplayer and communication features goes beyond the traditional gaming experience as it enhances interpersonal relationships, and such relationships satisfy a fundamental need for relatedness through interpersonal social interactions within the virtual world (Downie et al., 2008). In summary, video games are increasingly enjoyed as a collaborative social experience and consumers are keen to discuss and share knowledge about their favorite video games. However, previous studies focused only on a limited number of potential success drivers of video games. Thus far, to the best of our knowledge, no study has provided insights into social interactions as success drivers and adequately addressed management implications to

enhance and moderate these social interactions. Moreover, as far as we are aware, there are no studies, which explain the actual playtime of a video game. Previous studies mostly focused on the purchase process and the influential factors of a consumers' purchase intention, but not on the actual playtime, i.e., the actual use of a video game by consumers. Especially the average playtime is quite important from developers' point of view. As mentioned before consumers with a high average playtime are inclined to purchase additional features via DLCs and therefore further reducing developers' financial risk (Han et al., 2016).

Mostly the authors of previous research argued that the product features directly affect the expectation toward a video game, and therefore the relationship between the product features and sales should be detectable through a market analysis. Therefore, this essay tries to expand this research setting via an exploratory approach by transferring the basic assumption of Oliver's (1977) expectation-confirmation theory (ECT). We expand the findings in the field of video games, online communities and information systems by investigating 1) which product features enhance the number of owners of a video game and 2) which product features enhance the average playtime of a given video game. Furthermore, we 3) derive insights into the relative importance of social attributes in video games in relation to other product features known from the literature.

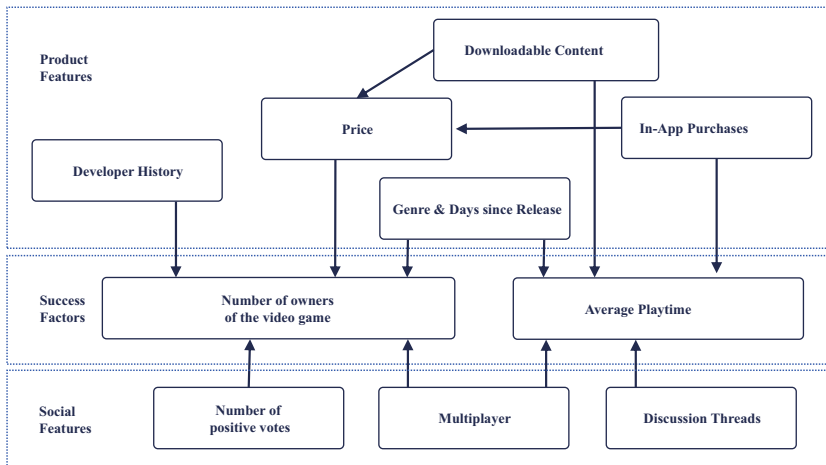
### **3.4.2 Conceptual Framework and Hypotheses Development**

Each video game is differentiated by its graphics, game mechanics, story, sound and multiplayer elements. According to Cooper (1979), the success of such a product innovation depends on the associated value by the consumers. Unlike pure utilitarian products, video games are hedonic products, as their primary purpose is to create positive emotions (Hirschman and Holbrook, 1982) and joyful and pleasing experiences (Marchand and Hennig-Thurau, 2013). From the perspective of the consumers, there is high uncertainty regarding whether the video game will fulfill this purpose. Since uncertainties are highly subjective and linked to partial information (Garner, 1962), the performance of the video game cannot be entirely predicted due to imperfect information (Salancik and Pfeffer, 1978). Uncertainties in consumer—seller relationships appear mostly due to information asymmetry about the product (Ghose et al., 2006). In the field of information systems, Dimoka et al. (2012) showed that based on the signal-theory (Kirmani and Rao, 2000), product features, references of the developer and third-party information (such as discussion threads and reviews) signalize a certain value, which results in a specific consumer expectation of the product ( in our case

video game). Based on the ECT, positive expectations lead to a purchase process and usage of the product. Subsequently, the perceived performance of the game is compared with consumer's expectations. Confirmation results in a satisfying experience, which, according to Oliver (1977), usually leads to repurchase and re-usage intentions. Therefore, based on the ECT, certain video game features, such as the price, genre and references of the developer, reduce the product uncertainty (Dimoka et al., 2012) and form the consumer expectation regarding whether to buy and play a video game.

However, in addition to these primary product features, we extended our framework to take social attributes into consideration. Today, gamers can communicate, exchange knowledge and support themselves through multiplayer features and chat functions similar to an online community. In general, these social interactions create benefits for each consumer (Butler et al., 2014) and therefore enhance the overall gaming experience. Consumers can follow discussions in numerous online forums or streaming services to obtain new information about the video game, e.g., the location of hidden treasures, new items or weapons (Bateman et al., 2011; Kuk, 2006; Millen et al., 2002). For example, there are groups of consumers who play a video game such as "Minecraft" and connect with each other through online forums and social media channels, which usually leads to motivating them to continue playing the video game (Minecraftforum, 2021). We propose that these assumptions are in line with network effect theories (e.g., Beck, 2006), which propose that the value for consumers of a membership in a network is positively influenced when new consumers join the network and expand it (Katz and Shapiro, 1994). Consequently, the benefits of consuming such a video game depend positively on the total number of consumers who purchased the latter (Church et al., 2008). Hence, based on previous reasoning, these benefits through social interactions (i.e., network strengthening elements) might become important success drivers for video games (Butler et al., 2014; Wasko and Faraj, 2005), since they can also directly affect the expectations of the video game e.g., based on consumer reviews and discussion on the product page prior to a purchase, as well as the perceived performance and the intention to play the video game again. Therefore, based on ECT as well as network effects, we analyzed the impact of product features and social attributes as success drivers of the number of consumers who bought the video game and the average playtime to gain an understanding of which features attract consumers to video games and which features motivate them to continue playing. Many studies confirmed that the interest in a product is strongly related to the congruence between the expectation regarding the quality of the product (Ridings and Gefen, 2004; Wasko and Faraj, 2005) and production efforts that meet the current standards. Therefore, it

is important to describe the main game features that might lead to expectations due to the product information on the website, i.e., Steam, which in turn could impact the number of owners of the game and the average playtime. Moreover, from a management perspective, these two dependent variables are very important as they shed light on the success drivers of video games, which helps to increase the sales volume of a video game and therefore reduce the production risk. Furthermore, the analysis of the average playtime is an important variable, since a game with a high average playtime usually sells in-apps more frequently (Marchand and Hennig-Thurau, 2013), and thus such features increase the video game revenue. From a research perspective, it is important to gain a better understanding of the impact of social attributes on hedonic goods, as they may need to be considered more frequently in future research studies. Consequently, we developed the framework shown in Figure 3.6 (Figure 3.9).



**Figure 3.9** Conceptual Framework

### *Impact of product attributes by video games*

Generally, products and software, e.g., video games, differentiate by means of certain product features. Those features create the general conditions, in which consumers decide whether the given game might be worth buying or at least trying out. However, research has shown that there is a process of evaluation regarding these expectations before and after playing the video game. According

to Oliver (1977), consumers create their disconfirmation of beliefs depending on their perceived performance of a product or service and the related expectations of the performance. For instance, with a higher price, the expectations rise and could therefore negatively influence the consumer behaviour due to a high perceived risk that the expectations might not be fulfilled, thus, a high pricing level for a hedonic product increases the perceived chance of a consumer being disappointed (Voss et al., 2003). Moreover, especially in the context of video games, the rise of “indie games” might even strengthen this challenge. Today, numerous high-quality titles are available with only a small monetary cost to consumers (e.g., “Ori and the Blind Forest”, “Cuphead”). Therefore, the gap between favorable but high-grade titles and full-price video games gets considerably larger so that the latter will be evaluated even more intensively due to the higher pricing. Nonetheless, in the context of video games, research has also shown that the price might also be assessed as part of the quality perception. For instance, Marchand (2016) showed that a higher price has a significant positive influence on the number of owners of video games. Best-selling video games (e.g., “Grand Theft Auto V”) have a very high production budget with state-of-the-art game mechanics, graphics, and sound effects. Therefore, a high price (typically \$59.99) increases the interest in the video game and most likely correlates with a high number of owners. However, Marchand (2016) also emphasized that a high price and impressive budgets for state-of-the-art game features mostly correlate with higher budgets for advertisements. Consequently, the number of owners might be affected by aggressive marketing strategies. A similar approach was adopted by Kardes et al. (2004), who showed that there is a certain group of consumers who always associate a high price with high quality. Nonetheless, this does not apply to every consumer and might even be interpreted as a special consumer group (Kardes et al., 2004). These assumptions are in line with behavioural learning theories, which propose that specific pricing triggers expectations that lead to a repeat purchase or not purchase (Rothschild and Gaidis, 1981). Research has shown that price is used as a quality cue, i.e., that price reliance is a tendency of consumers to depend on price as a cue to quality (Zeithaml, 1988). In particular, literature shows a positive response to price when quality is important, i.e., consumers have learned to take price as quality indicator into account and align their behaviour accordingly (Tellis and Gaeth, 1990). Especially in this context, most triple-A video games are related to a higher price, shaping the upper boundary of pricing in video games (Marchand, 2016). Hence, we assume that potential consumers have certain expectations of the video game due to the price, and therefore a video game with a relatively high price might be associated with

higher quality regarding the graphics and game mechanics. For this reason, we hypothesize:

**H1:** A higher price of a video game will positively influence the number of owners of a video game.

Developers can offer additional content for their games, which provides a new revenue stream as consumers have to pay for the new content. DLC (Downloadable Content) is additional content created for a released video game which can be downloaded as an upgrade (i.e., update through Steam) by a consumer. It usually includes new worlds or new characters. Here, DLC mostly distinguishes between directly unlocked content (e.g., the character is instantly selectable as an avatar) or unlockable content (e.g., the character has to be unlocked due to special quests). However, in both cases, the curiosity regarding the new content or the motivation to unlock the content increases the average playtime of a video game. Nonetheless, the content of DLC is noticeably smaller than regular expansions (i.e., a new “arena” vs. completely new games modes), which often leads to a higher number of DLC releases in comparison to regular expansions. For example, the video game “Witcher 3” contains about 19 DLC packages, which combined have a similar playtime to the initially released video game (Steam, 2015). In addition to DLC, the developer can offer in-app purchases, which are usually even smaller packages than DLC. These are small additional items, such as unique virtual weapons or goods, which can provide a direct advantage for a consumer (Han et al., 2015). However, according to Oliver (1977), those features could also impact the expectations of the consumers regarding the video game if that additional content is a necessity just to play the video game. If a consumer is not willing to acquire such content anymore, he may not be able to participate in the virtual world adequately any longer, which makes the video game more and more uninteresting and repetitive (Kane and Alavi, 2007). Such a lack of interest could harm the video game experience for everyone (Farnham et al., 2000). It might be advantageous for developers, to create high-quality DLC and interesting in-app purchases, so that most consumers are willing to buy such content. If successful, both aspects will tend to increase the average playtime. Therefore, we hypothesize:

**H2a:** In-app features will positively influence the average playtime of a video game.

**H2b:** A large quantity of DLC will positively influence the average playtime of a video game.

A successful video game can be expanded into a franchise (i.e., new games or content in the same universe), which is in the interest of a consumer if he likes the video game. However, the realization of sequels and DLC depends heavily on the general success of an established developer. Developers such as Blizzard, Electronic Arts or Ubisoft, with a high number of already published video games, are usually well known to consumers. Cox (2013) showed the significant influence of an established video game developer on the sales of video games. This is also true due to the “halo effect” in marketing literature. A positive feeling about a game company also influences consumers judgement towards new videogame releases (Cox, 2013). The perceived experience (i.e., the game making experience) of consumers regarding the developer due to published games might be interpreted by consumers as a quality index for games. Second, a broader history of published games signals to (new) consumers that more video games will be released in the future, which in turn affects the individual-level decisions (Butler et al., 2014) to buy the video game. Therefore, we transfer the basic assumption of Butler et al. (2014) to the context of video games. Consequently, even though the desire of users to obtain the new desired content only occurs after a satisfying gaming experience, users tend to ensure that this desire can be fulfilled in the first place, e.g., games that could have a follow-up title are more favorable. In fact, consumers are more skeptical about a developer who has only a few titles in the portfolio, as it seems uncertain that such a developer will release sequels and DLC. These assumptions are in line with the associative network theory (Aaker, 1990). Consumers tend to link associations of a brand to form certain expectation towards their products. This, in turn, might create a spillover effect. Therefore, the competence of an established company with a large product portfolio will be transferred to a newly released product (Balachander and Ghose, 2003). Hence, such products appear more attractive to the consumer than a comparable product from an inexperienced or unknown company. For this reason, we also assume that a high number of already published video games signals to a consumer a certain degree of quality. Consequently, we hypothesize:

**H3:** A high number of published video games by the same developer will positively influence the number of owners of a video game.

#### *Impact of social attributes by video games*

In addition to the primary game features in the previous discussion, there might be also influential social attributes that impact video game success. Based on the basic assumption of network theories, a membership in a network (i.e., a specific video game) is positively influenced by new joining consumers, which expand



and enable social interactions (Katz and Shapiro, 1994). For instance, in the context of video games, Cox (2013) showed that reviews are a statistically significant success driver. In principle, reviews have become a comprehensible and straightforward method for consumers to judge the quality and potential enjoyment of an unknown product. Here, consumers consider consumer reviews to be even more trustworthy and a good indicator of the overall quality (Chen and Lurie, 2013; Wu et al., 2013). Therefore, if most consumers recommend a video game through a positive vote, this reduces the perceived risk and cognitive dissonance in a pre-purchase situation for new consumers. Chen et al. (2004) confirmed that a high number of consumer votes better reflects the overall quality of a product. Consequently, more consumer votes could be more persuasive. Regarding the ECT (1977), the number of positive votes will be an indicator of the video game quality (Butler et al., 2014). Based on that idea, we conclude and hypothesize:

**H4:** A higher number of positive votes of a video game will positively influence the number of owners of a video game.

Moreover, an online multiplayer feature allows consumers from different places to play a video game together. Such a feature is a criterion for social interactions within the video game. If a video game has a multiplayer feature, social interaction can usually occur via chat functions or even audio communication (Williams et al., 2007). These technologies allow consumers to build new social relationships. In addition to the pure video game content (e.g., video game mechanics or graphics), these relationships are perceived as a great benefit by consumers (Ledbetter and Kuznekoff, 2011). In fact, the participation with each other affects the variety of the consumers individual video game experience (Buchanan-Oliver and Seo, 2012). As previously stated, social interaction creates benefits for the actual consumer (Church et al., 2008; Katz and Shapiro, 1994). When communication features are included, each video game tournament and each video game quest will be new and unpredictable and other consumers directly influence the video game enjoyment. Therefore, we propose that the multiplayer feature is a relevant driver of the average playtime of a video game (Cole and Griffiths, 2007; Hsu and Lu, 2004). The livelier the virtual world gets through the participation of other consumers, the more diversified the video game experience becomes and the longer and more frequently the consumers play the video game. Based on this discussion, we hypothesize:

**H5a:** A multiplayer feature will positively influence the number of owners of a video game.

**H5b:** A multiplayer feature will positively influence the average playtime of a video game.

In general, the membership in a network (i.e., a specific video game) is positively influenced when new consumers join the network, expand it and enable social interactions via discussion threads (Katz and Shapiro, 1994). Based on the findings of Butler et al. (2014), we suppose that external discussion forums are a further indication of the willingness to participate in the future. A variety of advantages originated in discussion forums, including access to hints (Galegher et al., 1998), support (Ridings and Gefen, 2004), and access to expert knowledge (Lampel and Bhalla, 2007). Such interactions generated by the community lead to a continuous update of the expectations regarding the future gaming experience among consumers. The intention to continue to participate in the community and thus to continue to play the video game is highly dependent on such expectations (Jin et al., 2010) and creates a perceived benefit (Katz, Haas, et al., 1973). Therefore, we develop the last hypothesis as follows:

**H6:** A large number of discussion threads will positively influence the average playtime of a video game.

### 3.4.3 Method, Research Design and Sample

To test our hypotheses empirically, we collected data from 401 video games from steam.com, which has 125 million active consumers and is the largest online video game distribution platform. The 401 video games were published between 2007 and 2017. For the data collection, all titles with a complete date set (provided by steam.com) were taken into account. This distribution system offers popular video games as well as features for communication and social interactions among the consumers. Steam.com is increasingly evolving into a common distribution platform, which therefore enables developers to eliminate the need for a specific publisher. From an empirical point of view, the high quality of the data offers a wide range of analytic approaches. In fact, publishers and developers do not make sales records of video games publicly accessible. For this reason, most of the recent studies (e.g., Cox, 2013; Marchand, 2016) which have examined success drivers of video games have collected data from third-party websites such as vgchartz.com. Unfortunately, it is not possible to check the validity of such data. Therefore, we have collected our data directly from the popular distribution platform steam.com. Table 3.12 provides an overview of the

operationalization and sources of the variables. Based on our hypotheses, our two dependent variables are the number of owners and the average playtime of the given video game. Steam lists the number of owners who have purchased the given video game on their platform. In our sample, the video game “Counter-Strike” had over 33 million consumers. The game with the smallest number of consumers was “Rocket Sky Racing” with only 1,044 consumers. On average, the video games in our sample had about 1.3 (SD = 2.7) million consumers. Since Steam creates a player profile for each consumer, it was also possible to determine the average playtime of each video game. In this regard, “Counter-Strike”, with more than 300 hours, was also leading. Conversely, “Smash Pixel Racing” was only played for 10 minutes on average. In summary, the video games in our sample were played for 25 (SD = 38) hours on average. For each video game, consumers can recommend the participation through a “thumb up/thumb down” voting system. This system indicates the number of previous consumers who recommend the video game. Moreover, consumers can create an endless number of discussion threads for each video game on Steam. We also included this number as an indication of how frequently consumers discuss the video game. This is a communication function that is heavily used by the consumers. Some video games have over 100,000 different discussion threads. Furthermore, the price of each video game at its release date was included. Steam also provides information about each developer. With this information, we were able to include the number of previously published titles. Moreover, we labeled the multiplayer feature and the in-app purchase feature with a nominal scale (1 and 0) according to whether the video game had such implementation or not. We also included the quantity of available DLC for each video game. As a control variable we included the release date. Thus, we were able to record the period between the release date and the data entry.

**Table 3.12** Variable Operationalization

<b>Dependent Variables</b>	<b>Operationalization</b>	<b>Data source</b>
Number of owners of the video game	Number of consumers who bought the video game.	<a href="https://steamdb.info/">https://steamdb.info/</a>
Average playtime	Average number of hours the consumers played the video game.	<a href="https://steamdb.info/">https://steamdb.info/</a>
<b>Independent Variables</b>		

(continued)

**Table 3.12** (continued)

<b>Dependent Variables</b>	<b>Operationalization</b>	<b>Data source</b>
Number of positive votes	The number of consumers who give a positive vote.	<a href="https://steamdb.info/">https://steamdb.info/</a>
Price	The price at the release of the video game.	<a href="https://steamdb.info/">https://steamdb.info/</a>
Developer reputation	The number of previous published games by the same developer.	<a href="https://steamdb.info/">https://steamdb.info/</a>
Multiplayer	The video game has a multiplayer feature = 1, 0 otherwise.	<a href="https://steamdb.info/">https://steamdb.info/</a>
Discussion threads	The number of discussion threads about the video game.	<a href="https://steamcommunity.com/">https://steamcommunity.com/</a>
In-app purchases	The video game has an in-app feature = 1, 0 otherwise.	<a href="https://steamdb.info/">https://steamdb.info/</a>
Downloadable Content (DLC)	The quantity of DLC for the video game	<a href="https://steamdb.info/">https://steamdb.info/</a>
<b>Control Variables</b>		
Days since release	The number of days between the release and the date of the data collection	<a href="https://steamdb.info/">https://steamdb.info/</a>
Genre	Each genre was set to 1 if appropriate or 0 otherwise	<a href="https://steamdb.info/">https://steamdb.info/</a>

Because of the rapid decline in the sales volume, in the context of video games, this variable is of particular importance (Cohen, 2014; Moe and Fader, 2001). Nevertheless, we assumed that video games which have been available for a more extended period are more likely to have sold more copies. Therefore, the days since the game was released has been included as a control variable. Consequently, the majority of our sample contains video games which were published between 2007 and 2017. Finally, the genre was also included in our data set as another control variable. In the context of video games, surprisingly little research has been conducted on the feature genre within the discipline of human behaviour in information systems. However, comparable research that has been conducted in other fields or industries (e.g., movies and books) provides further evidence that genre has a very important influence on the purchase intention because of personal interests (Austin and Gordan, 1987; Desai and Basuroy, 2005; Elberse

and Eliashberg, 2003). Therefore, we included this variable in our calculations as a dummy variable.

### 3.4.4 Results

To test our hypotheses, a structural equation model was computed in SmartPLS. This decision is based on the reasoning that our variables do not represent classical latent constructs, i.e., do not meet the requirement of at least three items, as well as the fact that we checked whether the available data correspond to our assumed model. Here, existing literature recommends the use of the partial least square method instead of a covariance-based method (Hair et al., 2013). To test our hypotheses, a structural equation model was computed in SmartPLS. This decision is based on the reasoning that our variables do not represent classical latent constructs. Here, existing literature recommends the use of the partial least square method instead of a covariance-based method (Hair et al., 2013). The overall model fit can be evaluated as excellent. Both the NFI (.916) and the SRMR (.044) for our data satisfy the recommended thresholds of NFI  $>.90$  and SRMR  $<.08$  (Hu and Bentler, 1999; Lohmöller, 1989). The R-squared (adjusted R-squared) of our dependent variables reports values of (1) “Owners of the Game” .648 (.638), (2) “Average Playtime” .385 (.368), and (3) “Price” .094 (.089). We also checked the variance inflation factors (VIF), which were all less than 2.0 and below the recommended threshold of 10 (Hair et al., 2013), concluding that multicollinearity was not an issue in our analysis. Moreover, one might point out that there might be a significantly high correlation between our two dependent variables “Owners of the Game” and “Average Playtime”. However, our data implies only a medium linear dependency with  $r = .436$ ,  $p < .001$ . Table 3.13 reports the results of our estimations. First, we are able to verify a positive effect between the price and the number of owners, which confirms our hypothesis H1. Therefore, our results are in line with findings from the findings of Marchand (2016) and Cox (2013). However, results show only a minor positive effect on number of the owners of the video game. We argue that there might be ambivalence of price perception and processing by consumers. On the one hand, a high price might be interpreted by a specific group of consumers as a quality index, which is similar to the findings of Kardes et al. (2004). Thus, a high price should generate certain expectations regarding the graphics and game mechanics. With a higher price, the expectation of consumers regarding the game quality is positively affected, which in turn leads to purchase behaviour (Tellis

and Gaeth, 1990). On the other hand, lower prices, e.g., due to promotion, general price decrease over time might positively impact the general willingness to buy that game, as a lower price reduces the perceived risk. Both reasons might apply to in our results. Consequently, a high impact of price effect cannot be observed. In addition, it should be mentioned that we added relationships regarding price, DLC and in-app purchases for controlling feature depending changes. However, we only see one effect: DLC do have a significant positive impact on price, which can be explained via bundle prices. Here, a very common strategy is a price increase after adding published DLCs to the core game as one package, which leads to an overall higher price. Yet, this relationship might be self-explaining.

However, adding these relationships allows us to control more effectively for the average magnitude of the discrepancies between observed and expected correlations as an absolute measure of model fit criterion (Hu and Bentler, 1999). Regarding in-app purchases, we can confirm a significant impact. Consequently, H2a is supported. One of the most important instruments of free to play business models is also reflected in our data as a crucial influencing factor of the average playtime. It becomes clear that with optional purchases (e.g., crystals, gold coins), the average playtime can be significantly extended. It can be assumed that an increase in “invested” playtime will in turn retrospectively increase the willingness to make further purchases. This phenomenon has already been confirmed by Han et al. (2015) in the context of mobile gaming apps. Moreover, we found support for our hypothesis H2b. DLC had a significant influence on the average playtime. Usually, each DLC package increased the average playtime by about an hour. Based on the prior discussion, it seems reasonable for game developers to offer both types of additional content, i.e., DLC and in-app purchases. However, the present results suggest that DLC dominates in-app purchases in two ways. First, statistically, we found that the effect size of DLC is almost twice as high as that of in-app purchases and thus has a stronger effect on the average playtime. Second, based on prior reasoning, the potential hazards, e.g., a player cannot participate anymore, are less pronounced for DLC than in-app purchases because of their “nature” of implementation, i.e., additional optional content vs. coins or crystals to continue the game. However, in contrast to DLC, in-app purchases might guarantee a constant income stream even from the same consumer. While the transaction of one DLC is completed with one investment, repurchases are very likely in the case of consumable items. Therefore, from an economic point of view, the second option seems more promising. Consequently, as both methods seem to be powerful, a balanced implementation seems the most reasonable strategy for game developers. The importance of the number of previous titles

**Table 3.13** Report of the Results

	Stand. Coef.	T-Statistic	VIF
<b>Number of owners of the video game (NOV)</b>			
Number of positive votes → NOV	.736***	13.660	1.025
Days since release → NOV	.215***	4.095	1.207
Developer reputation → NOV	-.07**	2.900	1.139
Multiplayer → NOV	.076**	2.034	1.255
Price → NOV	.077*	2.041	1.311
Adventure genre → NOV	.033 <sup>ns</sup>	1.496	1.103
Casual genre → NOV	-.051 <sup>ns</sup>	1.946	1.131
Strategy genre → NOV	-.092***	4.217	1.084
Racing genre → NOV	-.010 <sup>ns</sup>	.324	1.080
RPG genre → NOV	-.038**	2.629	1.116
Simulation genre → NOV	-.062**	2.347	1.183
<b>Average playtime (AP)</b>			
Discussion threads → AP	.386***	3.541	1.052
Downloadable Content (DLC) → AP	.229***	3.825	1.159
Multiplayer → AP	.189***	6.463	1.211
In-app purchases → AP	.107**	3.115	1.102
Adventure genre → AP	.146*	2.156	1.138
Casual genre → AP	-.016 <sup>ns</sup>	.590	1.130
Strategy genre → AP	-.047*	2.120	1.107
Racing genre → AP	.073*	1.593	1.076
RPG genre → AP	-.016 <sup>ns</sup>	1.300	1.092
Simulation genre → AP	-.020	.876	1.182
<b>Price (PR)</b>			
DLC → PR	.227***	5.841	1.040
In-app purchases → PR	.088 <sup>ns</sup>	1.783	1.040

from the same developer (operationalized and named as the variable “Developer reputation”) is significant. However, as we observe a negative impact, we have to note that a high number of video games previously released negatively affect the number of owners of a video game, and therefore we cannot confirm hypothesis H3. Based on the findings of Dimoka et al. (2012), we expected that a developer

with a large number of already published video games reflects a certain competence to be able to develop a high-quality video game. However, based on our findings we suppose that only to a certain degree of previously published video games consumers are positively affected because of a base number of titles in the portfolio (Butler et al., 2014; Cox, 2013). Yet, a higher number of games in the portfolio might indicate that the publisher does not specialize on a specific genre or publishes “everything” so that quality of new video games might suffer and thus, lead to reduced purchase confidence of consumers.

Furthermore, our hypothesis H4 can be confirmed by our data. As expected, a high number of positive votes positively affects the number of owners of a video game. The more positive votes can be taken into account by consumers, the more they tend to buy the game. We can show that the pure number of positive votes, i.e., recommendations by other consumers, provides the highest explanatory power for the number of owners of the video game. The importance of consumer reviews was examined in numerous publications. In the context of video games, the importance of this variable has been underestimated in the literature so far. As previous studies have shown (Chen and Lurie, 2013; Wu et al., 2013), consumer reviews are considered particularly believable and create an expectation that the specific video game has a high quality. Consequently, it will reduce the perceived risk and cognitive dissonance in a pre-purchase situation for new consumers. We can also confirm our hypotheses 5a and H5b. A multiplayer feature increases the average playtime of a video game and the number of consumers, which allows us to confirm the findings of Marchand (2016). Based on prior discussion, our results may imply that the participation of other consumers creates a livelier virtual world, and therefore the video game experience becomes more enjoyable. Consequently, consumers tend to purchase such video games more frequently.

Finally, we could also find a significant influence of the number of discussion threads on the average playtime of a video game. If the community regularly discusses a video game, they usually share knowledge and support among each other (Lampel and Bhalla, 2007; Ridings and Gefen, 2004), which leads to encouragement to play the video game again. This variable has not yet been investigated in previous research. However, the standardized regression coefficient indicates that this variable is the most influential factor to explain the variance of the average playtime. Consequently, we can confirm our hypothesis H6. Finally, our control variable “Days Since Release” has also a highly significant impact on the number of owners of the video game, which implies, as expected, that a more distant release in the past leads to a higher consumer base, however, the social factor of positive review of other gamers has the threefold positive impact considering the



standardized coefficients. By analyzing the genre, we were able to identify some genres that are played significantly longer than others. In fact, most of the games in our sample had their origin in the “action” genre, which consequently became the basis for our dummy analysis in the regression model.

Based on the significant differences between some genres, the integration of this variable as control variable for our model was important. Therefore, we could show that the basic assumptions of previous studies on the impact of the genre can also be applied to the context of video games (Austin and Gordan, 1987; Desai and Basuroy, 2005; Elberse and Eliashberg, 2003). Nonetheless the standardized regression coefficients indicate that those dummy variables are not as important as other independent variables.

### **3.4.5 Discussion and Conclusion**

The results of the presented study confirmed most of our predicted hypotheses. Current technologies and multiplayer features enable social interactions, relationships and communication between consumers from different countries and continents. Due to the pure hedonic character of video games, there is high uncertainty from consumer’s point of view if a video game actually generates joyful experiences. Since uncertainties are highly subjective and linked to partial information (Garner, 1962), the performance of the video game cannot be entirely predicted due to imperfect information (Salancik and Pfeffer, 1978). In the field of information systems, Dimoka et al. (2012) showed that based on the signal-theory (Kirmani and Rao, 2000), product features, references of the developer and third-party information (such as discussion threads and reviews) signalize a certain value, which results in a specific consumer expectation of the product respectively video game. Our results confirm the relationships of the signal-theory by addressing the importance of such features for the purchase and re-usage intention. Video games are more than just a product that a consumer buys at a fixed price and enjoys playing alone or with known friends. Instead, they also become a social experience where people from all over the world play together, communicate and share knowledge. Therefore, future research, as well as management, should address especially these social success drivers. This is especially important, since consumer reviews, the number of discussion threads and multiplayer features showed to be the most influential variables in our models. Despite these results, our research approach still has its limitations. The R-squared for both models showed that our predictors contribute significantly to the variance explained. Nonetheless, we argue that drivers of success that were not covered by

our Steam data exist. For instance, production and advertising budgets might also be important to explain the success of a video game. Via studies on motion pictures, research has shown that the production budget and the advertising budget are strongly correlated with the box office (Hennig-Thurau et al., 2009). Unfortunately, such data is not available for video games, and therefore we were unable to include these aspects in our study. However, we assume that additional data would increase the explanatory power of our research model. Furthermore, we cannot make any direct statements about the video game sales in retail stores nor how they relate to online sales. However, as Steam is the largest online distribution platform for video games, we assume that there is a certain correlation between the sales volume in retail stores and the number of owners of a video game stated by Steam. Video games that are in high demand in retail stores and presented conspicuously are also likely to be frequently purchased online via Steam. Furthermore, our statements are limited to video games for personal computers. However, browser and mobile games are also becoming tremendously popular (Pocketgamer, 2017), although such video games often have a completely different revenue model. The most successful games within this category are usually freemium video games, i.e., games that are free to play, and consumers will have to pay for additional available content (Liu et al., 2014). Although many of our predicted success drivers overlap with these games, we argue that this special revenue model needs further research. Here, the connection of entirely free content and in-app purchases might be differently processed by consumers in comparison to initial costs to access the video game and additional content. Although the effect of time is already taken into account by our control variable “Days Since Release”, it is indeed reasonable to examine an interrelationship of the other variables included in our model over time. It is conceivable that a game with a high advertising budget was initially purchased many times on the release date (e.g., Marchand, 2016). Based on a high sales volume, such success leads to a higher number of positive reviews and discussion threads, which in turn attract new consumers. To investigate this phenomenon, future research could analyze these data with new video games over a certain period. Moreover, our results indicate a negative impact of a high number of previously published video games by the developer. Based on previous research, we expect a certain number of published games as an indicator that might reduce risk prior to a purchase (Butler et al., 2014; Cox, 2013). Yet, we can only observe a negative impact of previously published games, so that we assume there might be a relationship that can be described by an inverted u-shape. Future research should therefore investigate an optimal number of games in a portfolio that on the one hand reduces risk for new consumers and acts as a quality indicator, however, on the other hand does

not cause the number of games to act arbitrarily. Moreover, based on the finding of Butler et al. (2014), video games are progressively enjoyed as a collaborative social experience. Through their involvement, consumers become creators of the gaming experience (Buchanan-Oliver and Seo, 2012), and the perceived value of those multiplayer and communication features goes beyond the traditional gaming experience (Downie et al., 2008). For that reason, future research needs to investigate aspects of social interaction and communication in more detail. We have already addressed the importance of “Lets-Play” videos for different streaming platforms (YouTube, 2021). Particularly successful channels and broadcasters certainly act as influencers and encourage potential consumers to buy a video game. In particular, the impact of these social media channels should be investigated thoroughly. However, it is also conceivable that some consumers are also acting as influencers in discussion forums. Further research is required to identify consumers and topics that directly lead to new purchases or increase the average playtime of a video game. Moreover, our research model did not take into account relations between video games and related events. For instance, professional matches in video games such as “Counter-Strike” are covered by popular events, i.e., the ESL-One series in Germany (ESL, 2021). Future research could investigate external events as additional success drivers. We argue, that games which have a higher number of active gamers might also attract companies that build an event ecosystem around them, i.e., tournaments. Consequently, games that are covered by such events might have a retroactive effect on sales of games and therefore on owners of a given video game. Although our study confirms the impact of several product attributes and social attributes on video game success, the direct influence on consumers and in particular, on consumer related outcome variables (such as emotions, attitude formation, and behaviour change) remains unexplored—a crucial limitation of this study due to its exploratory approach. Further research (through experimental approaches) is needed, to gain such insights. In cooperation with a developer, a newly released video game could be manipulated in terms of multiplayer and communication features for an experimental research setting, to gain deeper insights on the impact of such features on consumer related outcome variables. Finally, we proposed causal relationships based on previous research and basis theoretical assumptions. However, taking research on movie success into account (Hennig-Thurau et al., 2012), we argue that dynamics of relationships might also apply in this context. For instance, we proposed an impact of discussion threads on the number of owners of the video game. However, one might also argue that indeed a higher number of owners might affect the number of discussion threads, because more consumers in total want to share their opinions (Hennig-Thurau et al., 2004). Nonetheless, our

research data was based on single a temporal timeframe, i.e., a snapshot, and thus does not offer a potential investigation of reciprocal effects. Though, future research should take our results as foundation into account, however, investigate the dynamics of those success drivers and factors and how each of these central variables might affect each other over a given timeframe. Based on the previous literature, if a game offers a certain level of quality, developers should be encouraged to charge a respectively higher price for their product. Potential consumers will see the price as an indicator of the quality of the game and therefore be more likely to buy the game (Marchand and Hennig-Thurau, 2013). However, based on our data, we can only confirm a small direct positive impact of a higher price on the number of owners of the given video game. Here, we argue that a higher price mostly correlates, for instance, with higher production budgets and especially with a higher effort in marketing. Moreover, under the already mentioned development of indie games, AAA-Games are under special pressure to deliver exceptional performance for a given high price. Therefore, based on our results, we do not recommend relying only on price as a quality index.

Our results show that it seems reasonable for game developers to offer DLC and in-app purchases. However, based on our findings and the existing literature, DLC might dominate in-app purchases in two ways. On the one hand, we found a stronger effect on the average playtime, which leads to the conclusion that DLC keeps players in touch with the game longer. On the other hand, based on the existing literature, hazards are likely to be less pronounced for DLC than in-app purchases because of their “nature” of implementation, i.e., additional optional content vs. coins to continue the game. According to Oliver (Oliver, 1977), the latter feature could also impact the expectations of the consumers regarding the video game if that additional content is a necessity just to play the video game, which might ultimately lead to consumers quitting the game (Kane and Alavi, 2007). Conversely, in-app purchases might guarantee a constant income stream even from the same consumer. While the transaction of one DLC is completed with one investment, repurchases are very likely, e.g., for consumable items. Therefore, from an economic point of view, the implementation of in-app purchases seems more promising. Consequently, based on our results, we recommend using both ways of providing additional content as a development strategy for games because of the positive impact on playtime of both approaches. Nonetheless, developers should be more careful in the case of in-app purchases. While the benefits are twofold, i.e., positive impact on playtime and potential continuous review stream, they come with the costs of potential hazards that can lead ultimately to consumers quitting the game. Therefore, if the primary goal

is to keep consumers playing (e.g., until the next release of a game add-on), it seems more reasonable to use DLC instead of in-app purchases.

We were also able to show that the number of published games of a developer might affect negatively the success of a new game. However, a major problem for new developers since they are unable to profit from a broad portfolio of games and reputation. Therefore, it is recommended that new developers should cooperate with established developers and use their reputation to get started, i.e., signaling due to the explicit naming of the co-developer. Therefore, bundling might directly tackle the issue of perceived risk, as some previously published games are presented to the potential consumer. Yet, we strongly recommend based on our results to keep a streamlined portfolio to negatively affect consumers due to an uncertainty regarding the product quality. In addition, it is important to take feedback from consumers seriously. If errors are reported through reviews, they should be eliminated as soon as possible. Hopefully, this will lead to a more positive rating of the video game and thus potentially attract new consumers. Moreover, it makes sense to motivate consumers to give a positive review of the video game. Through push messages, consumers could be encouraged to rate the video game and thereby unlock access to special items in the video game itself. If consumers are not willing to evaluate the game in public, developers may instead ask for brief feedback as a direct message. That way criticism could also be recorded.

The appeal of online multiplayer features is a critical aspect to explain the success of video games. Butler et al. (2014) described the characteristics of consumers in online communities. The consumers of video games could connect, exchange information and support themselves through multiplayer features and chat functions. In general, these social interactions create benefits for each consumer within an online community as well as consumers of a given video game. These perceived benefits enrich the overall gaming experience. Based on our data, we recommend implementing such features in every new video game, even if integration tends to be more expensive. To absorb the economic risk that can arise from the production of high-quality video games, this multiplayer feature should always be implemented in the future. Even for video games that are traditionally focused on a story-driven single-player mode, the implementation of additional multiplayer features is highly recommended to enhance the consumers' experience. Therefore, each video game profits with at least one or two features that allow consumers to interact with each other and allow the creation of social connections. Since there are numerous options available, developers should try to implement a suitable solution in the early stages of development to ensure appropriate implementation. Moreover, developers need to be aware of the importance

of potential influencers on social media platforms and discussion forums. Consumers can follow discussions in numerous online forums or streaming services to obtain new information about the video game, e.g., the location of hidden treasures, new items or weapons. It is important to integrate those communication channels in the marketing strategy consciously, as this interaction continually creates an incentive to play the video game again.

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## **3.5 Interaction in Social Live Streaming Services**

### **3.5.1 Introduction**

In recent years, the digitization of our everyday life has been an increasingly important issue for researchers and society alike. Digital platforms with online communities have flourished and helped consumers enhance their work and social lives (Tiwana et al., 2010; Bharadwaj et al., 2013). Innovative technologies and digital communities have introduced new communication methods and heavily influenced our social interaction habits (Barrett et al., 2016; Baden-Fuller and Haefliger, 2013). Social networks have become a part of our lives, with Facebook alone connecting more than 2.3 billion active consumers every month (Facebook, 2019). A special form of social networks can be found in live streaming services that allows consumers to broadcast and consume live video streams through easily accessible platforms created solely for this purpose (Scheibe et al., 2016). Specially formed platforms, such as YouTube and Twitch, allow their members to produce and broadcast video streams that other people consume. Market leader, Twitch, was sold for \$970 million in 2014, and some of its broadcasters' streams are followed by more than one million consumers, demonstrating the market power of this phenomenon (Bründl et al., 2017). Live streaming services have become one of society's familiar tools, easily accessible through multiple platforms (Zhang and Byon, 2017; Lingel and Naaman, 2012). Streamed content stretches from large events to small "let's play" streams shared by companies and individuals (Colburn, 2013; Lingel and Naaman, 2012; Shen et al., 2014). Due to the different platforms' options, members who consume a stream broadcast by another member can use features to interact with those broadcasters and other consumers following the content (Scheibe et al., 2016; Friedländer, 2017). These options for social interaction are one of many means used to keep platform consumers engaged and connected to the underlying online community, which is very important for ensuring the platform's success (Hess, 2014). Unlike pure social networks, the interaction works in two directions: interaction with the video

stream's broadcaster or producer and interaction with other members consuming the broadcast. Researchers try to identify the consumer engagement success factors in online communities and explain consumer behaviour in those communities (Ross et al., 2009; Hars and Ou, 2002; Meng et al., 2015; Tsai and Bagozzi, 2014). According to social identity theory, individuals develop specific categories to define themselves and others depending on several characteristics, such as age, membership to specific groups, and gender (Turner, 1985). This identification process involves overlapping characteristics and values that lead to specific connections between consumers (Nambisan and Baron, 2010; Bhattacharya and Sen, 2003). Based on Muniz and O'Guinn (2001), such a consumer process of group association when watching a broadcast could have similar effects on the relationship between community members. Given that consumer identification with a particular group has been postulated as an important feature of increasing engagement in general, this theory might fit our study's purpose (Hogg and Terry, 2000; Zhu et al., 2015). Furthermore, previous research identifies that interaction quality, community size, and consumers' social ties are the main factors influencing the usage of social networks and the consumers' intention to interact in those communities (Lin and Lu, 2011; Shen et al., 2014; Shriver et al., 2013; Zhang et al., 2017).

Although some of the key elements of social networks and live streaming services are comparable, there are important differences between these two types of digital environments. First, social networks are built to keep people entertained and focused through connection and interaction with other consumers. They may also have additional features, but the key aspect of networking with other members does not change. Although the social attributes and interaction possibilities are also significant, the video stream is the key element of a live streaming service (the broadcast). Previous social network research findings might not be fully applicable because live streaming services require more consideration when examining consumer decision-making. The research conducted thus far in live streaming services examines the motivational factors of consumers as members and broadcasters and their motivation to share content (Bründl et al., 2017; Hamilton et al., 2014; Hilvert-Bruce et al., 2018; Zhao et al., 2018). Numerous studies include consumer interaction behaviours but are limited to interactions with other consumers or interaction with the broadcaster (Yu et al., 2018; Scheibe et al., 2016; Hu et al., 2017; Kim et al., 2018; Lim et al., 2012). Comparing the two directions of interaction is necessary to understand consumer behaviour in this research area fully. Nevertheless, extant research has not yet assessed the importance of consumer interaction possibilities on usage intention. Hence, our research tries to broaden the common knowledge of live streaming services by

1) investigating how social attributes influence the perceived usefulness of live streaming services from a consumer's point of view; 2) gaining insights into how social factors influence the perceived benefits to consumers of live streaming services; and 3) detecting how the intention of interacting with the broadcaster differs from the intention of interacting with other consumers. These insights will help guide further research into live streaming services and enable platform designers to better cater to their consumers' needs. This essay provides reasons for the general importance of social ties when assessing consumer behaviour within social networks. Two studies were designed and conducted, building on social identity theory and an extensive literature review. This research will help examine how social identity theory applies in this setting and identify future research areas regarding general online consumer behaviour within information systems. Furthermore, we derive managerial implications that will further help to develop new and existing platforms.

We refer to research results in two different areas to better understand consumer behaviour in the context of live streaming services. First, the platform's itself is essential to limiting or enhancing consumers' intentions to interact. The perception of the platform and the consumers' basic understanding of the presented system is key to their interactions. Second, the general behaviour of consumers in communities plays an important role in our studies. The following section presents relevant studies and theoretical models for both aspects.

### *Live Streaming Services*

Streaming services have become familiar to many consumers with the spread of additional bandwidth and other technological advances (Scheibe et al., 2016). These platforms are extensions of previous Web 2.0 developments that "allow the creation and exchange of consumer-generated content" (Kaplan and Haenlein, 2010). YouTube and Twitch are primarily focused on the exchange of video content, rather than text, photos, and news (like Twitter or Facebook), as an additional form of communication (Delerue et al., 2012; Hamilton et al., 2014; Macaranas et al., 2013; Hennig-Thurau et al., 2015). Due to technological development, the possibilities regarding video streaming are far more advanced and have reached a level that easily competes with traditional forms of broadcasting (Hamilton et al., 2014). Scheibe et al. (2016) differentiate two types of live streaming services: general streams that are not limited to any specific topic and topic-specific live streaming services focused on a specific topic. Individuals mostly use Twitch to broadcast their gaming performances, and broadcasting is topic-related (Hamilton et al., 2014; Bründl et al., 2017). Scheibe et al. (2016) analyze the motivations of individuals following a consumer-generated broadcast



and how reward and gamification elements affect their behaviour. Bründl et al. (2017) find that co-experience influences consumers' enjoyment while watching a stream. Furthermore, Macaranas et al. (2013) analyze various communication channels and how this influences consumers' connection to each other within a community. They indicate a positive influence on perceived enjoyment. Hu et al. (2017) focus their research efforts on how streaming services influence the group identification of individuals. In comparison, Zhu et al. (2015) determine video quality as an important content success driver for video producers. In summary, the extant research has not yet delivered results that combine information regarding interactions with other consumers and with the broadcaster.

### *Social Tie of Consumers Interacting in Online Communities*

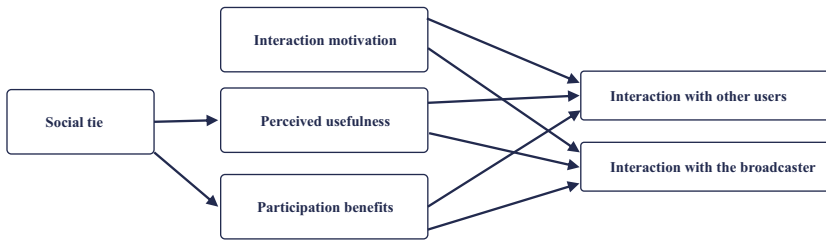
Consumers who interact during a broadcast are likely part of a similar community due to their relationship with a specific topic, such as eSports (Dholakia et al., 2004). Therefore, a basic knowledge of these phenomena in this specific setting is required, as it is important to understand the consumer's intention. Because this issue, in general, is the focus of numerous studies, we draw from this gained knowledge to find explanatory ground for our context. A significant number of articles have been published on the interactions of individuals in various fields of digitalized environments, including online communities and, more specifically, social media (McKenna and Bargh, 1999; Chen et al., 2011; Lee et al., 2013; Putzke et al., 2010; Ray et al., 2014).

A common theme in social network research is the unique role of social connection between individuals and their perceived connection to each other (Harvey et al., 2011; Chai et al., 2011; Nambisan and Baron, 2010). Generally, consumers' social connection or social tie refers to their relationship, the amount of contact, and the time allocated to communications (Huang et al., 2009). This "perceived togetherness" is an important influence on behaviours. Following social identity theory, many studies investigate the effects of the community's or organization members' proximity to each other (Monge et al., 1985; Constant et al., 1996; Kraut et al., 1988). Social identity theory provides reasons for consumers' general interest in social interaction and explains the behaviour of individuals in groups and communities. Researchers have long argued for its applicability in a digital environment (Gwinner and Swanson, 2003; Ray et al., 2014). However, it is considered that the social identity theory developed by Tajfel provides basic explanations for human interaction within groups (Tajfel, 1974; Tajfel and Turner, 2004). Recent studies show that the social connection of individuals has a significant influence on their overall interaction behaviours, a fact that has been studied

and established for various other connections, such as basic demographic similarities or prior relationships (Constant et al., 1996; Zenger and Lawrence, 1989; Krackhardt and Brass, 1994). In some cases, even a weaker tie is advantageous (or not disadvantageous). For example, Constant et al. (1996) show that individuals are helped by co-workers regardless of the relationship between the information seeker and the information giver within a company. Generally, researchers argue that the closer the connection becomes, the more beneficial it is for the community, positively affecting members and optionally associated organizations alike (Nambisan and Baron, 2010). Consumers identifying with the community elevates the community's value and enhances consumers' willingness to participate (Dholakia et al., 2004). According to social identity theory, in this position, individuals define different categories to classify themselves and others based on specific characteristics and properties (Turner, 1985). For example, categories might be guided by age differences, organizational connections, affiliation to particular groups, or gender (Ashforth and Mael, 1989; Tajfel and Turner, 2004). Overlapping characteristics and values are one aspect of this identification process, leading to specific connections between consumers and a company (Nambisan and Baron, 2010; Bhattacharya and Sen, 2003). Given that identification with a specific group is described as an important factor to enhance participation in general, this theory explains our research and the consumers' possible interaction behaviours when using live streaming services (Hogg and Terry, 2000; Zhu et al., 2015). Social connection and its importance to human behaviour in online environments are identified in several other studies (Dubois et al., 2016; Salehan et al., 2017; Pan et al., 2017). For example, word-of-mouth intention, the relationships between bloggers and their followers, and message-forwarding habits are connected to consumers' perceived social ties to other consumers (Harvey et al., 2011; Godes and Mayzlin, 2004; Chai et al., 2011; Lee et al., 2013). Lin and Lu (2011) argue that the number of peers and members involved within a social network positively affects consumer engagement.

### **3.5.2 Conceptual Model and Hypotheses Development**

Two different studies were conducted to derive answers for the stated research questions. The first study was a choice-based conjoint study built to gain knowledge about consumers' preferences regarding live streaming services. The second study was designed as a partial least squares structural equation model (PLS-SEM). Figure 3.7 provides an overview of the conceptual model and includes the considered factors (Figure 3.10).



**Figure 3.10** Conceptual Model

By incorporating influential factors of interaction intentions and general website usage, study two is intended to derive insights into the specifics of consumer interactions and the differences between the two interaction routes (with the broadcaster and with other consumers). The two interaction directions are the key elements of both studies as they aim to bring further understanding to broadcasts and consumers' interaction intentions.

Hu et al. (2017), Barasch and Berger (2014), and Haridakis and Hanson (2009) argue for the importance of social connections in explaining consumer behaviour. Nysveen et al. (2005) argue for the possible influence of this factor when consumers choose a communication medium, and Lin and Lu (2011) argue that a community's size positively relates to consumers' usage intentions. The first study takes an explorative approach to examine these arguments' applicability. The study's approach determines the importance of interaction aspects in the overall decision process of choosing a broadcast option compared to other features of online streaming services. Therefore, the number of broadcast viewers, the number of channel subscribers, the price, the language, and the picture quality are included as common additional characteristics of live streaming services. We review the influential factors of both variables in study two to investigate consumers' interaction intentions further. The price or video quality may be necessary when consumers are asked to choose live streaming services, but after they start following a broadcast, these aspects are likely to lose importance in the interaction behaviours. In the second study, we propose a connection between the social ties of consumers and the perceived value and benefits of participating. We explain and argue our corresponding hypotheses in this research, linking to the general online consumer behaviour and the research results regarding streaming services discussed in the previous cha. Building on social identity theory, the social ties of consumers are the key element of our research model. A social tie is defined as the strength of relationships, functioning as an indicator of social

relationships with other individuals, indicated through the frequency of consumer communication (Chai et al., 2011). We categorize the discussed effects of a strong social tie into three different traits following the previous research. Consumers generally form a perspective on a website's utilitarian aspects, connected to the website's social interaction possibilities (Ko et al., 2005; Bendapudi and Leone, 2003). Clement et al. (2001) argue that a tool is needed to collaborate with other people in social groups. Social networks are perceived as a valuable tool by their consumers. A live streaming service serves a purpose for those who seek to connect with other people. Song and Kim (2006) argue that social ties enhance the perceived value of a service or system. Therefore, consumers with strong ties to one another are likely to perceive such platforms as more valuable if they can socially interact and connect (Kwon and Wen, 2010). Previous studies also find that social ties can influence the perceived characteristics of social networks. For example, when examining consumers' usage intention, Lin and Lu (2011) find a connection between the site's perceived properties and the size of the connected network. Barasch and Berger (2014) derive similar results when examining the sharing behaviour of consumers. Furthermore, social ties can influence the attitude and perceived value of digital content (Chen and Lin, 2018). Therefore, the study proposes a connection between social ties and the overall usefulness of a live streaming service:

**H1a:** Strong consumer social ties positively influence the perceived usefulness of live streaming services.

Another trait of consumer social ties that is important for the present study is seen in the perceived benefits of the interaction. Researchers argue that participating in social groups may also be enhanced when the participants perceive their interaction as beneficial for themselves (Tsai and Ghoshal, 1998). Individuals evaluate their social interactions based on cost and benefits, and the results of that evaluation ultimately limit or extend their interaction behaviour (Blau, 1986). In the context of online communities, benefits are perceived as reputational gains or learning (Nambisan and Baron, 2010). Chai et al. (2011) evaluate the behaviour of bloggers and see the positive influence of social ties on knowledge-sharing behaviour, arguing that the perceived benefits of peer-related interactions are a key factor in this connection. Chiu et al. (2006) emphasize that the actual and expected benefits of sharing in a virtual community are strongly connected to the social ties of consumers. Ellison et al. (2007) examine the social network usage of students and find that the strength of social ties is influential in terms of the perceived benefits of interactions. Consequently, Kim et al. (2018) argue

that there is a connection between an online network and the perceived benefits of consumer participation. Therefore, we argue that social ties influence the perceived benefits of participation:

**H1b:** Strong consumer social ties positively influence the perceived participation benefits for consumers.

The motivations of consumers to visit a website or actively engage in online communities differ, so we need to differentiate between the “information motivation” and the “interaction motivation” (Ko et al., 2005). Early studies determine that consumers are merely interested in gaining basic information from a website in some cases, and any additional interaction or action on the website would hinder the re-visit intention of such a consumer (Ko et al., 2005). Social networks are designed to cater to the interaction motivation of consumers. The passive consumption of information is also possible but would not be sufficient to explain the consumer’s interaction behaviour. Individuals’ motivation is identified as highly relevant to any interaction activity (Wasko and Faraj, 2005; Berger and Schwartz, 2011). Researchers deem the interactivity of websites to positively influence consumer intentions to visit the website (Cho and Cheon, 2012; McMillan and Hwang, 2002; Crilly, 2011). Live streaming services provide two directions of possible interaction, and thus, cater to the idea of interactive aspects supporting the motivation of consumers to interact. In our research’s context, the general motivation to interact when visiting a live streaming service is important in explaining the following behaviour. Based on a consumer’s intentions to actively seek human-to-human interaction through a website or community, the probability of using additional elements of interactivity rises (Ko et al., 2005; Cho and Cheon, 2012). In considering this aspect and the results of previous research, our research’s purpose leads to the following hypotheses:

**H2a:** A high level of motivation to interact positively influences the consumers’ intention to interact with other consumers.

**H2b:** A high level of motivation to interact positively influences the consumers’ intention to interact with the broadcaster.

Researchers argue that the motivation behind interacting and participating in specific processes might be connected to self-serving consumer bias (Bendapudi and Leone, 2003). This aspect also provides valuable insights into our research context. The consumers’ intention to interact could also be connected to a perceived

gain or profit that the consumer might obtain. Schulze et al. (2014) also identify this phenomenon and state that the utilitarian aspects of the product could ultimately influence consumers' behaviour. Comparable examples are found in studies that argue for such effects concerning website usage in general and specifically social media and the related participation interest of consumers (Hoffman and Novak, 2012; Salehan et al., 2017; Xu et al., 2012). Lin and Lu (2011) identify a significant connection between the perceived value of social networks and consumers' behaviour. Bründl et al. (2017) also identify a significant influence of perceived usefulness on consumer behaviour. Individuals who share strong social ties could find a live streaming service more valuable and use communication and interaction features more frequently (Song and Kim, 2006). The provided platform enables them to join the community and actively participate (Kwon and Wen, 2010). Consequently, we argue that the perceived usefulness of a live streaming service influences the interaction of consumers:

- H3a:** A high level of perceived usefulness positively influences the consumers' intention to interact with other consumers.
- H3b:** A high level of perceived usefulness positively influences the consumers' intention to interact with the broadcaster.

Numerous online communities are based on the idea of consumers participating for free and spending their time supporting other members of the community (Dholakia et al., 2004). Open-source projects are a popular example of this behaviour among community members. The community grows through the members' combined knowledge and work efforts, and members individually provide their knowledge in support of the project (Hars and Ou, 2002). Ardichvili et al. (2003) conducted a qualitative study to identify the drivers and barriers to participation in virtual knowledge-sharing communities and explore the need for the perceived benefits, leading consumers to participate. Consumers often perceive the community as beneficial for their work and life and are keen to benefit from a solid community themselves. Through their engagement, they can help others and still see a benefit for themselves. Although social networks do not generally offer the opportunity to develop a new product or gather knowledge for a professional purpose, consumers still look for a benefit through participation. In this case, the benefit is more hedonic than utilitarian (Salehan et al., 2017). Therefore, we postulate the following hypotheses:

- H4a:** Perceived participation benefits positively influence the consumers' intention to interact with other consumers.

**H4b:** Perceived participation benefits positively influence the consumers' intention to interact with the broadcaster.

### 3.5.3 Study 1: Importance of Interaction Possibilities

As previously stated, the different options for consumers to choose a live video stream are vast and research has not yet elaborated on the specific elements of video streams and the role they play in consumers' choice processes. The goal of the following study lies in identifying the importance of interaction features in relation to other aspects of streaming services that might influence consumers to choose a broadcast option. To reach this goal, we conducted a choice-based conjoint experiment. Researchers used this approach because of its simplicity and comparability to real-life marketplace situations that participants can easily relate to (Hauser and Toubia, 2005; Currim and Sarin, 1984). The choice-based conjoint experiment helps us to determine the overall importance of individual attributes, and their corresponding levels, regarding consumers' decisions on broadcast consumption. Generally, a choice-based conjoint experiment is used to assess the overall product utility that is generated by different attribute levels of the product in question. By displaying different attribute-level combinations in every option presented, the participant is provided with clearly stated options and is required to make a choice between them. The participant is asked numerous times to decide between a set of three or four options that represent different versions of the product or service being investigated and an additional "skip" option that represents their choice to buy or use none of the presented options. Based on the answers by the participants, it is possible to understand the importance of attribute-levels regarding the research subject.

#### *Measures and Procedure*

To execute a choice-based conjoint experiment we needed to identify the attributes of broadcasts and assign levels to these attributes. These attributes and levels needed to clearly characterize different options and should be as close as possible to characteristics of existing online platforms to ensure the best possible outcome (Sawtooth Software, 2013). To meet these requirements, a small preliminary qualitative study was conducted ( $N = 12$ ). Participants were asked to name and explain key properties, that would guide their choice process when looking for a live streaming service. The attributes and corresponding levels were chosen for their authenticity and relevance to the context (e.g., the number of viewers and subscribers) or derived from other goods and services that are connected

to online communities and digitalized content (e.g., the price ranges regarding mobile applications). We included standardized content descriptions (e.g., picture quality and language) that are found on any type of picture or video consumption. All attributes and levels were tested and approved in a pretest ( $N = 25$ ). Table 3.14 provides an overview of the attributes and levels used. The list includes features related to social factors (e.g., interaction possibilities and size of audience), as well as technological features of the broadcast (e.g., picture quality). We chose not to include options regarding the broadcast theme or a specific platform, to free the experiment from possible bias.

**Table 3.14** Attributes and Levels included in the Conjoint Experiment

Attribute	Levels
Picture quality	low / medium / high
Interaction with other consumers	no interaction is possible / possibility to chat with other consumers / message board provided
Interaction with broadcaster	does not react to comments / reacts to comments
Number viewers of the broadcast	below 1,000 / up to 20,000 / up to 300,000
Number of subscribers of the channel	below 100 / up to 2,000 / up to 30,000
Price	free, without advertisements / free, with advertisements / 0.99€ / 1.99€ / 2.99€
Language	foreign language I do not understand / foreign language I understand / native language

The experiment was programmed with Sawtooth, an established tool for choice-based conjoint experiments. Participants were tasked to imagine themselves to be looking for a possibility to consume a video stream that they usually would consume online. Furthermore, any influences of genre or broadcaster would be rendered non-significant. Afterwards they were given four different options with randomly assigned levels of the attributes and asked to pick their favorite. This procedure was repeated ten times. The finalized questionnaire was distributed on various social media platforms and posted in several forums. The sample was reduced up to 30% due to incomplete questionnaires. Overall, the answers of 301 participants were used to determine the influence of the individual attributes and levels. 57.1 % of the sample were male ( $M_{\text{age}} = 26.37$  ( $SD = 9.12$ )). The final data set was analyzed based on two different methods that are commonly used when working with choice-based conjoint experiments. First, through a hierarchical Bayesian routine, we estimated the perceived utility



of each attribute-level, as well as the average importance of the attributes themselves (Arora and Huber, 2001). The wider the range between the values of the attribute-levels, the more important an attribute seems to be for consumers, since they clearly had strong preferences for certain characteristics of the attribute. The allocation of those values delivers an overall utility indicator for a product. These values can be compared to the participants' input and led to an overall assessment of the model. With a hit rate of 73%, we can testify that the overall prediction level of our approach and the resulting ideal configuration of a streaming option is fairly high. This procedure was followed by the application of the "counts method", a click frequency-based approach that provides statistical output to identify significant differences at individual levels for each attribute. This method is commonly used to validate the results of the Hierarchical Bayesian routine (Sawtooth Software, 2013). Table 3.15 depicts the average importance of the provided attributes. Based on the calculations we determined that the most important aspects (on average) of broadcast choice were 1) the price (31.35%), 2) the language (27.95%) and 3) the picture quality (18.15%). The included social indicators (e.g., interaction with broadcaster) of live streaming services derive by 5% of average importance. We can assume that the social aspects are not unimportant when choosing a broadcast but seem to function more as an additional feature that may mean the difference between otherwise equal broadcasts.

**Table 3.15** Average Importance of provided Attributes

Attribute	Average importance (%)
Price	31.351
Language	27.946
Picture quality	18.147
Interaction with broadcaster	5.834
Interaction with other consumers	5.681
Viewers of the broadcast	5.576
Subscribers of the channel	5.460

Nevertheless, with over 20% of the average importance related to the provided interaction methods, we can state that these services have an influence on the choice processes of consumers. With regard to the respective utility values, we identified attributes where the different levels had different impacts. This indicates that consumers prefer a certain level relating to certain attributes (e.g.,

low vs. high picture quality). In this case, we can see that the interaction with the broadcaster does have a significant effect ( $p < .01$ ), and that consumers strongly prefer broadcasters who react to their comments. After picture quality, language, and price, this was the only category with significant differences for the attribute-levels. Therefore, the results indicate a difference between interaction with consumers and interaction with broadcasters. While both types of interaction did account for approximately 5 percent of the overall choice, only the interaction with a broadcaster was significant in influencing the choice of consumers on a streaming option. Concluding, we were able to address our first research question and get an impression of the influences of social indicators on consumer's usage intention. The second study will further investigate these differences by identifying the differences in the underlying factors that drive consumers' interaction intentions.

### **3.5.4 Study 2 Influential Factors on Interaction Intentions**

All measures of the present study were drawn from well-established sources to ensure the reliability of our study. Measurements of possible interaction intentions by participants were adapted from Ko et al. (2005), as was the scale for interaction motivation. The social ties to other consumers were included in accordance with Chai et al. (2011). Perceived usefulness was measured with three items by Lin and Lu (2011). The participation benefits construct was adapted from Chan et al. (2010). All measures were measured reflectively and operationalized as seven-point Likert scales, anchored at 1 (e.g., strongly disagree) and 7 (e.g., strongly agree). In addition to these measurement scales, the participants were asked to provide demographic information at the end of the questionnaire (including age, sex and education). Participants for this study were recruited online, via mailing lists and social network groups. Prior to the first set of questions, minor introductions were given. Participants were asked to answer the questions regarding their live streaming service usage and evaluate the measures accordingly. Throughout the questionnaire, all tasks and questions were explained to the participants to avoid any complications. The URL leading to the study was spread through social media platforms and forums to reach as many people as possible. Again, the sample has to be reduced by 30% due to incomplete questionnaires. Therefore, the final sample consisted of 218 participants with  $M^{\text{age}} = 28.8$  ( $SD = 10.1$ ). Of the final sample, 50.5 % were female and 49.5 % male. To test our hypotheses and the overall measurement model, PLS SEM was conducted. Due to its parameter consistency and accuracy for smaller sample sizes the analysis

was conducted with SmartPLS 3.0 (Ringle *et al.*, 2015; Reinartz *et al.*, 2009). Table 3.16 and table 3.17 provide the derived results regarding the measurement statistics. As indicated, the yielded values are satisfying, and construct validity can be assumed. The individual factor loadings were all above 0.7 and the AVE was above 0.5 for all constructs, indicating convergent validity (Hair *et al.*, 2017). The cross loadings of all indicators were assessed and showing sufficient values (Chin, 1998).

**Table 3.16** Measurements

<b>Reflective Instruments</b>	<b>Outer Loadings</b>
<u>Interaction motivation</u> (Cronbach's alpha = .848; Composite reliability = .898)	.839
I wonder what others have to say.	.781
I want to keep up with what's going on.	.852
I want to express myself.	.841
I want to meet others with similar interest.	
<u>Interaction intention with consumers</u> (Cronbach's alpha = .846; Composite reliability = .928)	.946
Likely / Unlikely	.914
Possible / Impossible	
<u>Interaction intention with broadcaster</u> (Cronbach's alpha = .852; Composite reliability = .931)	.945
Likely / Unlikely	.921
Possible / Impossible	
<u>Participation benefits</u> (Cronbach's alpha = .896; Composite reliability = .935)	.907
My participation helps me build a better relationship with others.	.936
My participation makes the interactions more enjoyable.	.887
My participation helps me receive relational approval from others.	
<u>Social ties</u> (Cronbach's alpha = .925; Composite reliability = .947)	.892
I maintain close social relationships with other consumers.	.908
I spend a lot of time interacting with other consumers.	.920
I know other consumers on a personal level.	.896
I have frequent communication with other consumers.	

(continued)

**Table 3.16** (continued)

Reflective Instruments	Outer Loadings
Perceived usefulness (Cronbach’s alpha = .854; Composite reliability = .911)	.879
Using Social Live Streaming Service enables me to acquire more information or know more people.	.900
Using Social Live Streaming Service improves my efficiency in sharing information and connecting with others.	.869
Using Social Live Streaming Service is a useful service for interaction between members.	

The inner VIF of our constructs were below the threshold of ten and possible collinearity can be dismissed (Hair *et al.*, 2017). The overall research model was assessed by examining the path coefficients and corresponding significance levels. Table 3.18 depicts the results regarding the first hypotheses, related to social ties. As shown in the table, all indicators are significantly influenced by consumer social ties. Although the path coefficients for H1a and H1b indicate a large effect of social ties ( $\beta = .438$  and  $\beta = .575$ ), the  $R^2$  values indicate that the amount of explained variance is rather low. Nevertheless, both hypotheses are validated, indicating the importance of social ties. The indications taken from social networks literature seem to be valuable indicators for live streaming services.

**Table 3.17** PLS-Sem Model

	Interaction motivation	Interaction intention with consumers	Interaction intention with broadcaster	Participation benefits	Social ties	Perceived usefulness
Interaction motivation	.687	.477	.350	.315	.581	.310
Interaction intention with consumers	.691	.865	.388	.3	.399	.277
Interaction intention with broadcaster	.592	.623	.871	.251	.342	.161

(continued)

**Table 3.17** (continued)

	<b>Interaction motivation</b>	<b>Interaction intention with consumers</b>	<b>Interaction intention with broadcaster</b>	<b>Participation benefits</b>	<b>Social ties</b>	<b>Perceived usefulness</b>
<b>Participation benefits</b>	.561	.548	.501	.828	.329	.220
<b>Social ties</b>	.762	.632	.585	.574	.817	.193
<b>Perceived usefulness</b>	.557	.526	.401	.469	.439	.774

Note: Diagonal elements represent the AVE for reflective constructs. Correlations are underneath the diagonal; squared correlations are above the diagonal.

Building on social identity theory, the basic function for any form of social networking is reproducible for both research areas. The second part of the analysis focused on the aspects of the two-way interaction possibilities. Furthermore table 3.18 illustrates the corresponding path coefficients and significance levels. With one exception, all hypotheses were verified through the PLS analysis. With over 50% of the variance for interaction intention with other consumers explained, the results seem to yield a sufficient amount of explanatory power. By looking at the interaction intention with the broadcaster, the  $R^2$  value of .393 is adequate, but other influences must be missing to fully explain this trait of interaction. Overall, the results indicate that there are parallels and differences between the two interaction possibilities. Interaction motivation and participation benefits are in both cases significant influences of consumer's interaction intentions. When examining the path coefficients, the values for perceived usefulness derive the smallest amount of influence in the setting.

**Table 3.18** Results of PLS-SEM

<b>Path</b>	<b>Coefficient</b>	<b>Corresponding hypotheses</b>
Social tie → Perceived usefulness	.438 ***	H1a✓
Social tie → Participation benefits	.575 ***	H1b✓
Interaction motivation → Interaction intention with other consumers	.491 ***	H2a✓
Interaction motivation → Interaction intention with broadcaster	.432 ***	H2b✓

(continued)

**Table 3.18** (continued)

Path	Coefficient	Corresponding hypotheses
Perceived usefulness → Interaction intention with other consumers	.159 **	H3a✓
Perceived usefulness → Interaction intention with broadcaster	.05 n.s.	H3b✗
Participation benefits → Interaction intention with other consumers	.198 **	H4a✓
Participation benefits → Interaction intention with broadcaster	.235 **	H4b✓
	<b>R<sup>2</sup></b>	<b>Q<sup>2</sup></b>
Perceived usefulness	.191	.144
Participation benefits	.331	.266
Interaction intention with other consumers	.532	.440
Interaction intention with broadcaster	.393	.323
<b>Model fit</b>		
SRMR		.099
Chi <sup>2</sup>		571.408
NFI		.812

\* .05 < p < 0.1; \*\* p < .05; \*\*\* p < .001; n. s. = not significant

Bootstrapping procedure: 5,000 samples

N = 218 for PLS algorithm and bootstrapping

In the case of interaction intention with the broadcaster, the proposed connection cannot be significantly supported, forcing us to reject H3b. Although the derived results for both interaction traits are somewhat similar, their relationship with the perceived usefulness is certainly a key difference. Apparently, the overall perception of the usefulness of live streaming services does not necessarily determine consumers' intentions to interact with the broadcaster. Lin and Lu (2011), when examining the influential factors of social networks usage, also derived a smaller influence of perceived usefulness in comparison to other factors. Although their influences yielded a significant path coefficient, the results are relatable to our setting, as similar results are derived for the interaction with other consumers. The option to interact with a broadcaster possibly relates to more hedonic aspects. Kim et al. (2018) found pleasure to be an important factor when giving a gift to a broadcaster and argued that this perceived enjoyment

was a vital motivational trait for this form of interaction within live streaming services.

### **3.5.5 Discussion and Conclusion**

We found answers to the previously stated research questions through the two studies. The results of the first study provide new information regarding the decision processes of consumers in choosing live streaming services. Social attributes and indicators play a role when explaining the consumers' evaluation processes, but they are not as important as the product and technological features. Consumers value the social aspects, but their primary motivation is to use the video stream for entertainment. Therefore, social attributes are additional features that enhance the experience of consumers but are not necessarily the reason for usage. Study two derived further insights on the comparability of social networks and live streaming services. Out of the six proposed hypotheses, we can verify five. As expected, social ties were a strong indicator of the stated influence factors. Furthermore, the derived results indicated the proposed differences between interactions with a broadcaster and interactions with other consumers. Path coefficients showed a strong relationship between the corresponding constructs, and both interaction traits were similarly affected by interaction motivation and participation benefits. However, perceived usefulness did not significantly influence either direction of interactions. Therefore, we assume that differences between the two interaction traits should be considered. Since we used social identity theory to guide our studies, its effectiveness in explaining consumer behaviour is undoubtedly supported by the results of our research. However, in contrast to previous studies, we have to limit the importance of social identity's theoretical implications. The results of the first study indicate a difference between live streaming services and other forms of online communities. Nevertheless, the results enlighten the social networks field research area. However, some aspects of human behaviour are still undetermined. Building on our research, the influential power of social ties should be further assessed. This choice-based conjoint experiment was efficient at gaining insights into this field, but different research approaches should be used to develop a better understanding of the influences on consumer choice. A further distinction should be made relating to

the possible social connection indicators. Our research design includes interaction possibilities through message features and network size. Kim et al. (2018) examine gift exchanges between consumers and broadcasters as another form of interaction. Their results indicate a strong relationship to perceived social connections. Therefore, these elements should be included in future research designs. Broadcasters and their personalities may potentially play an important role in the overall choice process. Some broadcasters on Twitch have many followers who enjoy the content that the broadcaster provides. It is possible that consumers' use and interaction intentions are closely related to their perceived social ties with the broadcaster and only loosely related to their social ties with other consumers (Zhao et al., 2018). Furthermore, we limited our research to consumers' intention to interact with other consumers and broadcasters, not considering other possible outcome variables. A significant amount of research has been conducted regarding word-of-mouth in online environments. Therefore, it is fair to assume that this phenomenon would also be a desirable outcome for live streaming services (Hennig-Thurau et al., 2004; Berger and Schwartz, 2011; Dubois et al., 2016; Godes and Mayzlin, 2004). Further research should investigate the relationship between consumers' usage intentions and word-of-mouth. The results provide managerial implications in two different areas. First, a live streaming service should provide capabilities to stream high-quality videos for a reasonable price (or free), as this would reflect the ideal choice for consumers. Since this is sometimes neither possible nor feasible, streaming services could implement other forms of revenue that do not charge consumers. Sponsorship, product placement, or simple advertisements could be possible solutions. Second, a live streaming service should clearly emphasize the social factors of its platforms and allow consumers to interact with one another. Consumers could connect with one another and broadcasters through message boards, chat options, or email avenues. Although unrelated to a specific video stream, these features might strengthen the social ties of consumers and could also affect their intentions to interact. These interaction possibilities should be offered with an emphasis on potential benefits. Connecting with other consumers in chat rooms and on message boards would lead to further engagement. The inclusion of live streaming options in traditional social networks is undoubtedly a threat. Thus far, live streaming services have had the advantage of advanced video technology, but the lack of social attributes could be a critical factor in future competitiveness. Therefore, such platforms should focus on their unique strength, the video stream, while enhancing their networking possibilities. The video is why consumers join the service, but the networking possibilities could be why they stay. Broadcasters can also derive valuable insights from the results of our research. Although the technological



infrastructure and video quality depend on the platform, broadcasters could potentially enhance consumer interaction through a professional experience in video streaming. The results of study one's count methods indicate that consumers' interaction with the broadcaster is more influential if the broadcaster reacts to messages received. Broadcasters could gain more followers if they attempt to engage in conversations.



## 4.1 Core Results and Conclusion

Digital products have become increasingly important for businesses and consumers through new technologies and services. As a result, buying digital products has become common practice for consumers. The growing adoption of mobile devices and shopping in webstores not only affect consumer behaviour but also the development of products, services and marketing channels in general. As a result, marketing scholars and practitioners have to recognize this shift in consumer behaviour. This thesis pursues several research objectives based on the phenomena of digital products and their success drivers (product attributes and social attributes). Both academic and management research issues were addressed through five essays. This thesis advances marketing knowledge about consumers' evaluation processes and purchase intentions of digital products and offers implications and strategies for businesses. Each of the five essays addresses a specific research objective and provides: 1) general implications for marketing literature; 2) recommendations for further research; 3) implications for management. The following chapter provides an overview of the results by summarizing and discussing each of the key findings of each essay. The chapter also explains the implications for future research by identifying the limitations of each study and making recommendations for future research.

### *Essay 1: Drivers of Market Success for Mobile Apps*

Using Cohen and Basu's (1987) cognitive categorization theory, the first essay employed an exploratory technique to find and assess the attributes that significantly influence consumers' purchase decisions for digital products (using

mobile gaming apps as an example for the experimental study). First, a preliminary study was conducted to determine crucial product attributes and social attributes of a choice-based conjoint experiment. The essay's declared goal was to determine which attributes influenced consumer expectations and, as a result, purchase intentions. The utility of each level and the average relevance of each attribute was estimated. From the consumer's point of view, the most important attributes were the icon, genre and price, according to the results of the choice-based conjoint experiment. According to Cohen and Basu's (1987) categorization theory, the visual appearance of a product is one of the most essential aspects in the classification process, which Barsalou (1992) has already proved. Based on the determined average relevance of the icon, the findings of the first paper support this assertion. Furthermore, earlier research has also addressed the significance of genre (Desai and Basuroy, 2005; Elberse and Eliashberg, 1993; Austin and Gordon, 1987), which appears to be particularly significant to consumers in the case of mobile gaming apps because distinct genres are linked with specific game mechanics and concepts. The results show that the attribute price is extremely important, which is similar to Liu's (2012) findings. Therefore, a developer should avoid specifying a fixed price. Rather, a mobile gaming app should be free to download with in-app purchases, but it is crucial to be aware that not all consumers are willing to pay for such features. As a result, the conversion rate of the mobile gaming app has to be taken into account. Finally, as long as the mobile gaming app achieves an average positive rating, the ratings of other consumers, which cannot be changed by the developer, play a relatively negligible role.

*Essay 2: The Role of Colour Contrast and Predominant Primary Colour of Icons for Mobile Gaming Apps in Influencing Consumer Reactions*

The second essay focused on the visual representation of the digital product or mobile gaming app as icons are of great importance to consumer choice decisions, based on the findings of the previous essay. The second essay examined the influence of colours and colour contrasts within an icon on consumers' emotional responses, attitude formation, brand personality and intention to download a mobile gaming app. Applying the assumptions and implications of congruence theory (Osgood and Tannenbaum, 1955) and the 'match-up' hypothesis (Kamis, 1990), a combination of similar colours for the icon should positively influence consumer perceptions and intention to download. The results suggest that an analogous contrast in the icons of a mobile gaming app has a direct positive effect on the emotional dimensions of pleasure, arousal and dominance. The use of such a colour contrast also enhances consumers' hedonistic perspectives in attitude

formation. The results indicate that the use of analogous colour contrast in the icon of a mobile gaming app has a positive impact on several brand personality factors associated with the icon and, perhaps, with the mobile gaming app itself. The results also suggest that the use of an appropriate colour contrast leads to a higher download intention among consumers, at least in the research scenario. In this respect, the results of the second paper are consistent with those of Gorn et al. (1997) and Schloss and Palmer (2011). Nevertheless, the results of the experimental study did not confirm the hypothesis that outcome variables are also influenced by the dominant primary colour within the icon. This suggests that colour contrasts may reduce the influence of certain colours on consumer evaluation and behaviour. Furthermore, emotional responses do not have a mediating effect, as hypothesized in the research model. However, the positive direct effects of similar colour contrasts on observed consumer outcome variables are an interesting discovery for marketing and online consumer behaviour research. The essay highlights the necessity of the aesthetic appearance of a digital product as a crucial component for its market success. As a result, the findings provide guidelines for developing an effective and efficient icon for mobile gaming apps in webstores.

*Essay 3: The Role of Visual Congruence for Brands in Influencing Consumer Behaviour.*

The third essay addressed the effects of the visual congruence (colour harmony and aesthetic appeal) of several digital products on consumer-related outcome variables. The results of the third essay highlight the influence of colour contrast on consumers' perceptions and purchase intentions of digital products using five studies with different case scenarios and presentation techniques. The proposed hypothesis is that an object's analogous colour contrast has a positive influence on consumers' perceived colour harmony, aesthetic appeal, emotional response, attitude, trust towards a brand and their behaviour. The results show that analogous colour contrast is perceived as more harmonious and aesthetically appealing. The emotional dimensions of pleasure, arousal and dominance are also positively influenced, and the use of analogous colour contrast has a positive effect on attitude and trust towards a brand. The results of the third essay further imply that the use of analogous colour contrast within an object has a positive impact on consumer behaviour, which can be mediated by consumers' emotional responses. Overall, the results are comparable to those of Gorn et al. (1997) and Schloss and Palmer (2011), who showed that grouping similar, congruent colours within a stimulus leads to pleasant consumer responses. Nevertheless, the results of

the paper refute the assumption that the dominant colour of an object influences consumer-related outcome factors. Even when the participants' preferred colour is taken into account, this statement remains true. Such results imply that colour contrasts can minimize the influence of individual colours on consumer perception, evaluation and behaviour. According to Miniard et al. (1991), product involvement could act as a moderator between the experimental factors and the consumer-related outcome variables. Both the degree of cognitive processing and the persuasiveness of processed information are influenced by consumer involvement (Swinyard, 1993; Celsi and Olson, 1988; Petty and Cacioppo, 1986).

#### *Essay 4: The Need for a Community: The Impact of Social Attributes on Video Game Success*

Essay 4 analyzed the importance of social attributes in video games and the managerial implications of developing and moderating these interactions. Consumers are eager to debate and share knowledge about their favorite video games as they become more popular as a social community experience. Essay 4, therefore, draws conclusions about the relative importance of social attributes to the success of video games compared to other product attributes addressed in the literature. More specifically, this essay examined how important game attributes (e.g., genre) interact with social attributes (e.g., multiplayer features) to influence two important aspects of video game success: the number of owners and the average playtime. The results of market data indicate that for both dependent variables, the majority of the assumptions about the effects of the specified attributes and features are correct. The results show that both consumer ratings on a distribution platform and a multiplayer feature have a positive impact on the number of actual owners of a video game. As for average playtime, the data suggest that discussion threads and multiplayer features have a positive impact. Surprisingly, the number of positive votes and discussion threads have the greatest impact on the dependent variables, highlighting the importance of social attributes for market success. As these elements are independent of the video game itself, they are also important for single-player games. Consequently, even games that are traditionally considered single-player experiences are influenced by the social context and by incorporating these social attributes, game developers and distribution platforms gain valuable information for future development

#### *Essay 5: Interaction in Social Live Streaming Services*

Essay 5 examined the incentives consumers have to join a community and share their expertise with others. Several studies have looked at consumer communication behaviour, but none have looked at the relationship between consumers and

producers. Streaming services, in particular, allow viewers and broadcasters to communicate directly with each other through chat features and voice messages. Such social attributes may be particularly important from a consumer perspective to join a particular community. The results of the first study helped understand how consumers make usage decisions related to live streaming services. Although social characteristics have an impact on consumers' evaluation process, they are not as important as product and technical characteristics. For example, consumers tend to love social attributes but use video broadcasts mainly for a passive entertainment experience. Consequently, social attributes in live streaming services are an additional feature that enhances the consumer experience.

Nevertheless, the second study contributed to understanding the comparison between social networks and live streaming services. Social ties were, a strong indicator of the aforementioned influencing factors. Moreover, the proposed differences between interactions with a channel and interactions with other users were also indicated by the derived results. The results showed a strong relationship between the corresponding constructs, and both interaction characteristics were similarly influenced by interaction motivation and the benefits of participation. The perceived usefulness of a live streaming service did not significantly influence either interaction direction. Furthermore, the effectiveness of social identity theory in explaining consumer behaviour related to social networking and live streaming services is certainly supported by the results of our study. The results of the first study indicate a difference between a live streaming service and other forms of online communities where social identity theory may be sufficient to explain the majority of human interaction behaviour.

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## **4.2 Research and Theoretical Implications**

This thesis offers several implications and theoretical extensions for research in the subfields of the digital products studied. In doing so, the work draws on the general assumptions of congruence and expectancy effects and has, thus, contributed to these areas of research, particularly by addressing the five research objectives. The first three essays show how congruence perception and processing and, thus, congruence between (unconscious) expectations and incoming information, influence consumers' perceptions, attitudes and behaviours towards digital products. Additionally, the fourth and fifth essays explored the impact of social attributes as a driver for market success.

*Essay 1: Drivers of Market Success for Mobile Apps*

The findings of the first essay have important implications for future research and also highlight some of the studies' shortcomings. First and foremost, the results are limited to the category of games in the app store; therefore, conclusions cannot be fully generalized to other app categories, such as commercial or educational apps, which are primarily used for utilitarian purposes. Future research should also consider interaction effects; for example, it is possible that a paid mobile gaming app with integrated advertising could be disliked by consumers. Additionally, the two attributes of screenshots and descriptive text could not be included in this choice-based conjoint experiment due to their diversity. Game mechanics and gameplay are also visually represented in the screenshots of the mobile gaming app and influence consumer expectations. Due to the wide range of design options, further research is needed to investigate these effects. Descriptive text is also displayed alongside mobile gaming apps, which is another feature that gives consumers a strong impression of a game's mechanics. The moderating influence of the attitude and involvement variables was ignored in the study design. Well-informed groups of consumers search for certain types of mobile gaming apps, and as a result, the perceived usefulness of the product feature may vary by a consumer group. Such consequences should be studied in more detail in the future. Additionally, the study was conducted among consumers in Germany. Previous research in the area of personality and consumer behaviour has revealed numerous significant personality differences based on demographic variables (e.g., age, culture and education) as well as differences in overall online behaviour across nations.

*Essay 2: The Role of Colour Contrast and Predominant Primary Colour of Icons for Mobile Gaming Apps in Influencing Consumer Reactions*

In general, colours are described by certain attributes, namely, hue, saturation and brightness, and the effects of colours on consumers' perceptions and evaluations can vary depending on the design of these elements (Labrecque and Milne, 2012). In the second paper, the hue of the predominant primary colour of an icon in a mobile gaming app was not manipulated. In this context, Deng et al. (2010) suggest that consumers of the NikeID online shoe configurator do not emphasize brightness as much as they focus on hue and saturation. In the context of brand logo design, Labrecque and Milne's (2012) findings suggest that the perceived brightness of colours influences consumers' perception and evaluation of the brand. Given these conflicting results, future research should consider the effects of manipulating the other colour attributes (saturation and brightness), not only in isolation but also in combination with different hues on consumer-related

outcome variables. In the experimental study, participants saw only a single icon of a mobile gaming app, but in app stores, consumers are typically exposed to more than one icon along with additional information (e.g., game name, verbal information, price, ratings, screenshots, reviews). In an app store, a mobile application's icon is not usually presented without associated information. Therefore, future studies should investigate whether the results of this study still hold when the hypotheses are tested in an experimental setting that includes and systematically manipulates additional information about the app. The sample size of this study was relatively small, and because sample size determines the margin of error in the results of statistical tests, the effects of an experimental treatment are more difficult to detect in small samples (Cohen, 2013). Thus, in future research, it is advisable to conduct similar experimental studies with larger samples to increase the statistical power of hypothesis testing and potentially identify more significant effects of experimental factors on the constructs under study. Last but not least, the experiment was limited to mobile applications from a specific category, namely, mobile gaming apps, and was only conducted in one country. Due to this limited external validity, future research is needed to examine the identified effects with other products in other product categories. The sample was conducted among consumers in Germany, and previous research on personality and consumer behaviour has shown some important differences between personalities in terms of demographic variables and general online behaviour across countries. Previous research on the influence of colours on consumer behaviour has also shown that consumers from different cultural backgrounds are likely to have different associations and preferences for certain colours (Aslam, 2006). This could lead to differences, for example, in consumers' attitude formation or evaluation of the brand personality of the same product (Block and Kramer, 2009).

### *Essay 3: The Role of Visual Congruence for Brands in Influencing Consumer Behaviour*

As mentioned earlier, colours are described by three specific dimensions, namely, hue, saturation and brightness, and the effects of colours on consumer perception and evaluation differ depending on the design of these elements (Labrecque and Milne, 2012). In these studies, only the hue of the predominant primary colour was manipulated. Therefore, future research should also consider the effects of manipulating the other colour attributes on consumer responses. Furthermore, participants were only exposed to the manipulation of an unfamiliar brand in different scenarios. Other information about the company (e.g., reviews, brand awareness) will also certainly influence consumer behaviour. Future research



should address this by examining the impact of these different aspects and their interactions on consumer-related outcome variables. The results of the fifth study and, in particular, the subsample, should be replicated in future research. The eye-tracking jar could detect a real change in participants' consumer behaviour, even in a small sample. It is reasonable to assume that participants found a complementary colour contrast unpleasant and either consciously or unconsciously avoided this area with their eyes. These findings have important implications for product design and advertising. Therefore, research should further investigate the neural processes, in particular, to better understand this behavioural change.

*Essay 4: The Need for a Community: The Impact of Social Attributes on Video game Success*

The fourth essay looked at the impact of social attributes on the success of video games. According to Butler et al. (2014), video games are increasingly enjoyed as a collaborative social experience. Consumers become shapers of the gaming experience through their participation (Buchanan-Oliver and Seo, 2012), and the perceived value of multiplayer and communication features goes beyond the typical gaming experience (Downie et al., 2008). Therefore, future studies should focus on specific areas of social interaction and communication. The importance of 'lets-play' videos for various streaming platforms (YouTube, 2021) has already been discussed in the fourth and fifth essays. Successful channels and broadcasters undoubtedly act as influencers that encourage potential consumers to purchase a video game. In particular, the influence of these social media channels should be thoroughly researched. However, it is possible that some consumers also act as influencers in online forums. Further research is needed to find users and topics that directly lead to new purchases or increase the average time spent playing a video game. Additionally, the relationships between video games and related events were not considered in our research model. Popular events, such as the ESL One series in Germany, include professional competitions in video games, such as 'Counter-Strike' (ESL, 2021). External events could be investigated as additional determinants of success in future studies. Finally, the fourth article offered a causal relationship and theoretical assumptions based on previous research. The dynamics of relationships could also apply in this scenario, as demonstrated by research on film success (Hennig-Thurau et al., 2012). However, the research data were based on a single temporal interval, i.e., a snapshot, and do not allow us to examine reciprocal effects. Future studies should take our findings as a starting point and investigate the dynamics of these success factors and components as well as the interactions between these fundamental variables over time.

*Essay 5: Interaction in Social Live Streaming Services*

The results of essay five shed light on the research field of live streaming services. Nevertheless, some questions are still unresolved from a research point of view. First, the influencing power of social ties should be further investigated. The choice-based conjoint experiment is efficient to gain insights in this area, but other research approaches should be used to develop a better understanding of the influences on consumers' choices regarding live streaming services. A further distinction should be made concerning the possible indicators of social connections. Kim et al. (2018) examined gift exchange between consumers and broadcasters as another form of interaction. Their findings suggest a strong relationship with perceived social connection. Therefore, these elements should be included in future research designs.

Broadcasters and their personalities could play an important role in selection. Some broadcasters on Twitch have a large number of followers who enjoy the broadcaster's content. It is possible that consumers' usage and interaction intentions are closely related to perceived social ties with the broadcaster and only loosely related to social ties with other consumers (Zhao et al., 2018). Research is also limited to consumers' interaction intentions with other consumers and broadcasters and ignores other possible outcome variables. Much research has been conducted on word-of-mouth in online environments, and, likely, this phenomenon would also be a desirable outcome for live streaming services (Dubois et al., 2016; Berger and Schwartz, 2011; Godes and Mayzlin).

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### **4.3 Managerial Implications**

The findings of the studies within this thesis highlight the importance for marketing practitioners to address the specific needs of each subsector. In doing so, the work offers numerous useful insights to meet these needs and promote business activities. In doing so, this work did not limit itself to a specific consumer sector or a single product but took a broader approach to examine the impact of product attributes and social characteristics on the success of digital products.

Consequently, this work provides new insights and implications for managers in five main areas: (1) product design; (2) advertising placement and design; (3) webstore design; (4) e-commerce product presentations; (5) community management.

*Essay 1: Drivers of Market Success for Mobile Apps*

The conclusions of this essay are relevant not only to mobile gaming apps but also to video games and other hedonistic products in general. When digital products are juxtaposed in an e-commerce environment, consumers make judgments based on the product features presented. In such scenarios, it is reasonable to assume that the most important criteria, such as visual appeal, price and average ratings, are weighted equally.

However, the results of the study could be used by developers, publishers and webstore providers to better attract mobile gaming app users. The results show that the icon of a mobile gaming app is a crucial factor in determining its perceived value. This is particularly interesting because an icon can be fully customized by the developer without being restricted by the app store. Furthermore, a developer must be aware of the fact that certain genres are extremely popular or unpopular. The decision to develop a game in a certain genre could directly impact the price or revenue model, compensating for low perceived utility. It is also important to pay attention to what other people have to say. When bugs are reported in reviews, they should be fixed as soon as possible in the hopes of increasing the game's good rating and potentially attracting new users. Developers can also use the results to promote their products. To attract new users, it can be beneficial to address genre, price or average rating in communication initiatives.

Additionally, the results are particularly useful for developers as this allows them to calculate the overall perceived usefulness of their own mobile gaming app as well as the overall usefulness of competitors' mobile gaming apps. As an app store has multiple lists (e.g., charts, newly released apps and notable apps), it is helpful to find out which mobile gaming app features are listed side-by-side and update the icon design or price to attract more potential consumers in the market.

*Essay 2: The Role of Colour Contrast and Predominant Primary Colour of Icons for Mobile Gaming Apps in Influencing Consumer Reactions*

Publishers and software developers can consider the results of the second essay to better attract consumers of mobile gaming apps through effective, efficient and appealing product design via the icon. The results of the experimental studies show that analogous contrast in an icon of a mobile gaming app could lead to positive effects as they positively influence user-related outcomes. The results of the second paper also suggest that app developers, publishers and app store providers are not aware of these effects.

According to previous research (Bonnardel et al., 2011; Deng et al., 2010) and the results of this study, a consumer's attraction to a particular colour scheme can have a significant impact on their experience of interacting with, for example, a website or product in an online store. This has implications for the consumer's perception and evaluation of the content at hand as well as trust, satisfaction or future interaction with the website (Lee and Rao, 2010; Cyr, 2008). In terms of webstore design and e-commerce product presentation in general, one might conclude that subtle design differences can lead online users to either complete transactions or abandon a decision, not only in the context of mobile gaming apps (Cyr et al., 2010). As mentioned earlier, the influence of experimental factors on user-related outcome variables may also be influenced by culture (Cyr et al., 2009). In the context of webstore design, Cyr et al. (2010) revealed that a website's colour design is an important determinant of trust and satisfaction with the website, with differences found across cultures. Therefore, companies should be aware of the potential cross-cultural differences in the effect of colours, colour combinations and other design elements.

*Essay 3: The Role of Visual Congruence for Brands in Influencing Consumer Behaviour.*

Marketers can consider the findings of the third essay to better appeal to consumers through visually appealing products, advertising and web design. The results show that analogous colour contrast positively influences several consumer-related outcomes. The experiments span multiple touchpoints that consumers may have with a brand. The results confirm that the visual appearance of a brand certainly plays an important role in consumers' perception and evaluation of a brand and triggers certain associations. Therefore, colours are an effective communication tool. Moreover, the results suggest that analogous colour contrast should always be preferred by marketers. Based on our data, there is no recommended constellation for the use of complementary colour contrast as it does not positively affect consumers' emotional response, attitude or buying behaviour in any way. Moreover, a complementary colour contrast does not lead to increased attention towards the brand. The result of the eye-tracking experiment showed that participants tend to avoid the object with a complementary colour contrast as they unconsciously tend to look at the object less often. Interestingly, all of the effects are generally detached from the predominant primary colour of the object. The results of previous research (Metha and Zhu, 2009; Elliot et al., 2007; Bottomley and Doyle, 2006; Gorn et al., 1997; Valdez and Mehrabian, 1994) certainly provide exciting insights into the influence of a single colour in a monochromatic environment (e.g., red leads to higher arousal, and blue is generally associated

with competence). However, once the brand appears with a secondary colour, the impact of the single primary colour is completely neutralized by the colour contrast. Therefore, marketers should consider the results of our studies and use analogous colour contrast for brand design more often.

*Essay 4: The Need for a Community: The Impact of Social Attributes on Video Game Success*

According to the findings of the fourth essay, it is crucial to consider social attributes and their impact on consumers and the market success of digital products. For example, when problems are reported through community reviews, they should be fixed as soon as possible. This will hopefully lead to a higher rating of the digital product (in this case, video games) and, thus, attract new consumers. It also makes sense to encourage consumers to rate the video game positively. Consumers could be encouraged via push notifications to rate the video game to gain access to exclusive items within the game. Alternatively, developers can ask for quick input via direct message if users are unwilling to rate the game publicly.

The appeal of online multiplayer features is a crucial aspect in explaining the success of video games. Butler et al. (2014) described the characteristics of consumers in online communities. Video game consumers can connect, share information and support each other through multiplayer features and chat functions. In general, these social attributes create benefits for each consumer within an online community and consumers of a particular video game. These perceived benefits enrich the overall gaming experience. Based on market data, it is prudent to implement such features in any new video game, even if integration tends to be more expensive. To absorb the economic risk that may arise in the production of high-quality video games, this multiplayer feature should always be implemented in the future.

Even for video games that traditionally focus on a story-based single-player mode, the implementation of additional multiplayer features is highly recommended to improve the gaming experience for consumers. Therefore, every video game should include at least one or two features that allow consumers to interact with each other and create social connections. As there are numerous options, developers should try to implement a suitable solution in the early stages of development to ensure proper implementation.

Finally, developers must be aware of the importance of potential influencers on social media platforms and discussion forums. Consumers can follow discussions on numerous online forums or streaming services to obtain new information about the video game, such as the location of hidden treasures, new items or weapons.

It is important to consciously integrate these communication channels into the marketing strategy as this interaction always creates an incentive to play the video game again.

#### *Essay 5: Interaction in Social Live Streaming Services*

The results of the fifth essay are relevant to managers in two areas. First and foremost, a live streaming service should be able to stream high-quality video at a low cost (or for free) as this would be the perfect option for consumers. As this is not always practical or feasible, alternative revenue streams should be explored that do not involve a cost to consumers. Sponsorship, product placement and simple advertising are all possibilities. Second, a live streaming service should emphasize the social attributes of its platforms and allow users to connect.

Consumers can communicate with each other through message boards, chat rooms or email alternatives. While these elements may not be associated with a single video stream, they can enhance consumers' social connections, which can influence interaction intent. These interaction opportunities should be presented with a focus on potential benefits. More engagement occurs when there is interaction with other consumers in chat rooms and on message boards. Live streaming opportunities on traditional social networks are undoubtedly a threat. Live streaming services have so far benefited from improved video technology, but the lack of social elements could be a deciding factor in future competition. Therefore, these platforms should focus on their most important feature, video streaming, while enhancing their networking capabilities. Consumers come for the videos, but they may stay for the networking opportunities.

The results of this paper may provide useful information for television broadcasters. Although the platform determines technological infrastructure and video quality, broadcasters could significantly improve the consumer experience by using a professional video stream. The results of the counting techniques from the first study showed that engagement with the broadcaster has a greater impact when the broadcaster responds to the messages received. When broadcasters try to engage in dialogues, they can gain more followers.

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## **4.4 Concluding Remarks**

By developing and examining a research framework and addressing specific research areas, this thesis contributes to the current literature on online consumer behaviour. In general, the findings of the five essays are based on marketing research and experimental studies. They relate to consumers' perceptions,

evaluations, reactions, and behaviours toward digital products, services, and technologies. In addition, the findings contribute to the knowledge and practice of academic marketing research. Each paper draws on different samples and research methods to provide specific answers to help understand consumer behaviour in different areas and contributing to the understanding of the relevant phenomena. Based on the signal theory and congruence theory, this thesis demonstrates the impact of different product attributes, such as icons, genres, age restrictions, and price, as well as social attributes, such as average ratings from the community, critics, and communication channels, on the evaluation process and purchase intentions of a given consumer, leading them to buy, download or stream a specific digital product. In particular, the visual representation of digital products greatly influences consumer expectations and purchase intentions. Consumer expectation can be additionally reinforced by other product attributes (e.g., price and genre), but also by social attributes, such as reviews and ratings by the community. From a research and developer perspective, it is important to seriously consider these aspects in a pre-purchase phase, as product attributes and social attributes affect the expectation process and are mostly detached from the actual functionality of the product itself.

However, there are also limitations that should be addressed for further research. In examining the statements from the essays, it becomes clear that most of the relationships are based on a short-term effect, due to their experimental nature. However, long-term changes in consumer behaviour remain neglected. Furthermore, the experiments mostly include unknown brands. Therefore, it is unclear how these effects could change if transferred to established brands.

As a recommendation for managers, it is important to use icons, photos, and videos perceived as harmonious and esthetically pleasing. These two factors have a crucial impact on several consumer-related outcome variables, such as emotions, attitudinal formation, and quality perception. These effects can be further enhanced by the community. Therefore, developers and producers need to pay attention to crisis management, complaint management, and social media management. Finally, the product itself must meet the expectations derived from product features and social attributes and satisfy consumer needs to generate positive word-of-mouth and consumer satisfaction.

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