



# Does Luxury Brand Work with Live Commerce? Based on Live-streaming Platforms

Wenhua Mao

*Economic Department, University of California, San Diego San Diego, California  
wlmao@ucsd.edu*

## Abstract

Live commerce has become an increasingly important sales channel under digitization. Live commerce, as a form of digital platforms, has three main characteristics: entertaining nature, no equipment restriction, and frequent huge discounts. But whether features of live commerce work well with luxury brands remains unclear. On the one hand, the accessibility of luxury brands is limited to ensure exclusiveness. Those three characteristics may not fit perfectly with branding image of luxury brands. On the other hand, as the live-streaming room allows a higher consumer capacity, this form of digital platforms allow luxury brands to better promote their products. This research investigates the relationship between live commerce and luxury brands and reveals several important findings. First, live streaming sales do not hurt consumers' perception of luxury brands, including price perception, social class perception, product quality perception, service quality perception, etc. Live streaming sales also contribute to consumers' willingness to purchase. Second, having public figures with bad reputation to promote the luxury brands on live-streaming platforms has no effect on brand image, while the existence of public figures with good reputation on live-streaming platforms promotes overall luxury brand image except the common-design perception. These findings contribute to insights in the impact of live-streaming platforms and literature in economics of digitization.

**Keywords:** *luxury brand, live commerce, e-commerce, brand image, e Retailing*

## 1. INTRODUCTION

Online shopping dominates an essential role in the marketplace and the format of online shopping is constantly evolving. Taking e-commerce market in the United States as an example, e-commerce accounts for 16% of total retail sales in 2019, up from 7.2% in 2010 [1]. In merely one decade, the share of e-commerce in total retail sales is nearly tripled. Nevertheless, this incredible phenomenon not only happens in the United States. E-commerce market expansion in China has also been significant over the last decade, given that sales hit 38.3 trillion on Single Day<sup>1</sup> in 2019, up 28,000 percent from a decade earlier [1].

Moreover, the market penetration of the number of internet users worldwide has significantly increased, from 58.3 percent in 2016 to 65.2 percent in 2021 [2]. Over the past two years, to further release the potential of online shopping and increase consumption behavior, live commerce, a new format of online shopping, has gradually caught attention from the public.

Live commerce has three main characteristics: entertaining nature, no equipment restriction and frequent huge discounts. First of all, consumers can interact with the streamer in the live room. Streamers usually introduce products in an entertaining way. Consumers can ask questions and get response in a conversation style. The interaction is similar to the conversation between consumers and shop assistants in the offline store. Second, one might argue that this scenario is no different from TV shopping. However, the indispensable device for TV shopping is the TV. Television is not portable and can only be used on certain occasions. A phone call is also necessary to place the order, which may add barriers in the process. Nonetheless, the device used for watching live streaming is the smart phone, which has an indisputable advantage in terms of portability. People can watch live streaming on any occasion and place the order with only one click on the phone instead. Lastly, it is common for streamers to strike deals with merchants. Merchants offer discounts to collaborate with streamers and sometimes give free gifts with the products purchased during the live-streaming session. This kind of promotion or heavy discount

happens rarely in traditional stores or online shopping. Live commerce, the emerging shopping format, has been widely concerned by the major e-commerce platforms. It is important because it can also be considered as an effective marketing method. Following this trend, Amazon, the world's largest e-commerce platform, started Amazon Live in 2017. As live e-commerce can significantly increase product sales, well-known brands can benefit from this marketing method by introducing the products in detail in the live streaming room. Individual businesses can redirect the online traffic to their online stores by increasing the entertainment value of their live streaming rooms.

Live commerce has brought a disruptive change to online shopping but features of live commerce may not work well with luxury brands. Live commerce may not fit perfectly with the brand image that luxury brands are trying to build and maintain. The past few years have been an upswing for live commerce, with many brands partnering with streamers. Luxury brand managers are also paying attention to this shopping format. Primarily in China, where live commerce is well-developed, the number of luxury brands that "operate an account on beauty and fashion-focused social channel RED, are up from only 13% in 2019. 49% of brands have an official account on Douyin, China's version of TikTok, up from 33% last year." [3]. This information, therefore, reassures that live commerce is widely applicable to luxury brands. However, there are also many controversies surrounding this shopping method. A report from Gartner Inc indicates that true luxury goods such as bags or jewelry are rarely included in live-streaming rooms, because luxury brand managers are concerned that this shopping format may hurt the luxury brand image. Luxury brands build on their brand image based on product quality and excellent offline store service. The features of live commerce may not be consistent with what luxury brands try to convey. So, will live-commerce work with luxury brands?

The relationship between live-streaming and luxury brand image can go either way. On the one hand, the accessibility of luxury brands is limited to ensure exclusiveness. This sense of exclusiveness is shown in multiple ways. First, in terms of distribution, luxury brand stores are usually located in the capital city [4], especially in prestigious shopping areas [5]. Second, on the decoration side, sales environment of luxury brand conveys characteristics of luxury brand to consumers [6]. That is the reason why luxury stores are usually considered as shopping cathedrals [4]. Third, luxury brands decrease accessibility and increase rarity through pricing strategies. Luxury brands conduct premium pricing strategy, and thus fully increase symbolic benefits [6]. In addition, luxury brands rarely provide price discounts to avoid risking brand image [7]. However, regarding accessibility and discount level, the above characteristics of luxury brands are incompatible

with characteristics of the live streaming. Luxury brand image might suffer from being promoted and sold in the live-streaming room.

On the other hand, as the live-streaming room does not limit the number of consumers participating, more consumers can watch the streamer introducing the luxury brand and learn about the brand. Such brand education might pique consumers' interest. In this case, luxury brand image may be well-preserved, and the additional sales via this shopping format is an additional benefit for luxury brands.

To empirically study the relationship between live-streaming and luxury brand image, this paper conducts online cross-subject experiments. It develops multiple hypotheses and applies t-test to conduct hypothesis testing. Study 1 aims to reveal the overall effect of live commerce on luxury brands. Study 2 explores how living streaming can assist luxury brand with maintaining their brand image. Specifically, study 2 look into the effect of public figures on luxury brand image.

This research filled an important literature gap by providing an empirical study on luxury brand image and live-commerce. Thus far, very few studies have explored the association between the online accessibility of luxury brands and brand image. Kluges and Fasnacht [8] reported that online accessibility of luxury goods does not affect brand image. In addition, Gfrerer [9] showed that implementing online shopping will not lead to any problems and will be successful. However, live commerce is a new format of online shopping and has only occurred for few years. Whether live commerce affects luxury brand image remains unanswered has not been previously investigated in the literature. That is, the impact of live sales on luxury brand image is ambiguous.

The contribution of this study to managerial implications is three-fold. First, it contributes to the management strategy of luxury brands in online marketing field. Over the past decade, most research in live commerce has emphasized on video game streaming. There are no articles studying the impact of live stream on luxury brands. Live streaming is an emerging shopping format and becomes increasingly popular among people of all ages, while luxury brands also desire to tap into this huge market. This paper shows that live commerce does not hurt luxury brand image and this sales channel might even help with willingness to pay. In addition, luxury brands can benefit from collaborating with public figures with good reputation, and do not get hurt from collaborating with public figures with bad reputation. This paper shows that luxury brands can explore this sales channel without the risk of brand image damage.

Secondly, it provides insights regarding the collaboration between public figures and luxury brands. In order to promote sales and promote brand image,

luxury brand companies tend to hire streamers who are known as an eloquent person in the live streaming industry to introduce products. This paper shows that a public figure with a good reputation can attract more viewers and provide consumers a favorable impression of the brand. The presence of a reputable public figure will bring positive impact on live-streaming room and brand. At the same time, public figures can also use the brand's positive image to enhance their popularity. This paper points out a win-win scenario between live streamers and luxury brands.

Last but not least, this study hopes to contribute insights into the managerial strategy of live-streaming platforms. In the past, luxury brands have rarely appeared in the wide variety of goods sold through live streaming rooms. However, nowadays, live streaming software becomes more mature. Given that the live streaming platforms support the promotion of various brands, live commerce became more popular among luxury brands. With increasing collaboration between luxury brands and live-streamers, live platforms need to utilize the strength to upgrade platform features and enhance consumer experience based on user profile, user persona, and user portrait.

The rest of the paper is organized as follows: Study 1 investigates the overall effect of live commerce. It examines the effect of offline stores and online stores on luxury brand image respectively, and then compare the differences between sales effects on offline and online stores. Building on study 1, study 2 further looks into how luxury brands can improve or maintain online shop experience and brand image. It investigates the impact of public figures with different reputation in the live-streaming room on brand image. Last section summarizes findings and provides concluding remarks.

## 2. STUDY1: THE OVERALL EFFECT OF LUXURY BRAND

Study 1 is designed to measure overall effectiveness of live commerce on brand image. It tests and compares the impact of sales channels, i.e. live commerce or offline stores, on different brands (fast fashion brand or luxury brand). Three experiments were distributed online. The experiments used between-subjects study design. Only subjects with college education level or above are selected. Based on the given information about sales channels and brands in each experiment, participants are asked to rate how they feel about the brand's quality, service, willingness to purchase, etc.

Three surveys were distributed on a Chinese online survey platform. To prevent participants from making subjective assumptions about brands and providing biased results, these surveys did not include a specific luxury brand name in the luxury brand condition. The luxury brand name in the survey is simply "Brand 2"

and the survey explained that Brand 2 is designed by reputable designers and is perceived as a symbol of high social status. Furthermore, there exists the possibility that, if the same participant receives multiple conditions in order and answers multiple sets of surveys, the participant might be able to guess the intention of the experiment and thus provide a biased result [10]. Therefore, the experiments used a between-subjects study to control the order effect and the learning effect, with different people responding to each survey. The t-test is used to verify statistical significance.

Word and Picture Manipulation. Brief textual information about luxury brand is given separately in the survey serving as the control group of experiment. The other two surveys not only give brief textual explanations but also provide pictures visualizing the scenes where luxury brands are sold in offline stores and live streaming room (see Figure 1 and 2). Those two surveys serve as the treatment groups. Based on given information on each survey, participants were asked to rate the brand's quality (1 = very rough, 7 = very delicate), price (1 = very low, 7 = very high), their willingness to purchase (1 = very low, 7 = very strong), how much they agree the brand's consumers will receive high quality service (1 = strongly disagree, 7 = strongly agree), and how they feel about the brand's products (1 = very economical, 7 = very luxury).



Figure 1 picture of sales in the offline store



**Figure 2** picture of sales in the live streaming room

Education level. Subjects whose response time is unusually long or short are excluded to ensure the data quality. In addition, subjects whose education level is below college education are also excluded. The rationale is that education level is usually highly correlated with income level and consumers with only a high school degree may not have experience with luxury brands, the key study object in my study. Filtering out these subjects mitigates the confounding factor that participants give a favorable answer towards the brand they are familiar with and they can afford. In this case, the education

level and income level are perceived relatively consistent across groups

Result and Discussion

Effect of sales in offline stores on brand image. First, there exists a significant effect of offline store of luxury brand on brand quality perception compared with the control group. This result shows that, selling luxury products in offline stores can boost consumers' perception on brand quality. Second, selling in offline stores also has a significant effect on product perception. Namely, people perceive selling in offline stores makes the product more luxurious. The effect on price perception is significant as well, which indicates that sales of luxury products in offline store makes the public perceive the product to be more expensive. Forth, there is a significant effect on perception of consumer social class, demonstrating that people consider that consumers of Brand 2 (i.e. luxury brand) are more likely to be in upper class. Furthermore, since there is a significant difference in means of service perception between control group and treatment group, consumers agree that they are more likely to get honored service in luxury store. Nonetheless, offline stores help with luxury brands with brand image in every aspect but not the willingness to purchase. Based on data from the control group and the treatment group, there is no significant difference in terms of willingness to purchase. The above information is summarized in Table 1.

**Table 1.** Comparison of Control Group and offline group

Survey Item	Mean of Control Group	Mean of Offline Store Group	T-test
I feel brand' s quality is (1=very rough, 7=very delicate)	4.83	5.77	-2.93**
I feel brand' s product is (1=very economical,7=very luxury)	4.39	6.23	-5.5208***
I feel brand' s price is (1=very low, 7=very high)	4.76	5.63	-2.58*
I feel consumers of brand are more likely to be in upper class. (1=strongly disagree, 7=strongly agree)	4.71	5.86	-3.56***
How much do you agree brand' s consumer will receive honorable service (1=strongly disagree, 7=strongly agree)	4.37	5.89	-4.46***
My willingness to purchase is (1=very low, 7=very strong)	4.00	4.21	-0.61

Significance levels: \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$

Effect of sales in live streaming room on brand image. First, there is a significant difference between the means of quality perception, indicating that sales in live-streaming room help with luxury brand image. Next,

product perception of luxury brand is positively influenced and considered to be more luxurious in the live streaming room. Third, the result of brand price perception confirms that true difference in the means is

not equal to 0. Namely, consumers perceive sales in live streaming makes brand more expensive. Perception of consumer social class is also significantly different, indicating that the public believe that consumers of luxury brand are mostly wealthy people while selling it in live streaming room. In addition, the effect on service perception is significant, which demonstrates that sales in live streaming room can also provide high quality service in people's mind. In the end, unlike the effect of sales in offline stores discussed above, sales in live streaming room can also improve the willingness to purchase. The above information is summarized in Table 2.

**Table 2.** Comparison of Control Group and Live-streaming Group

Survey Item	Mean of Control Group	Mean of Live-streaming Room Group	T-test
I feel brand's quality is (1=very rough, 7=very delicate)	4.83	6.06	-3.77***
I feel brand's product is (1=very economical, 7=very luxury)	4.40	5.45	-3.12**
I feel brand's price is (1=very low, 7=very high)	4.76	5.55	-2.42*
How much do you agree brand's consumer will receive honorable service (1=strongly disagree, 7=strongly agree)	4.71	5.43	-2.14*
How much do you agree brand's consumer will receive honorable service (1=strongly disagree, 7=strongly agree)	4.37	5.71	-3.86***
My willingness to purchase is (1=very low, 7=very strong)	4.00	5.02	-2.65**

Significance levels: \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

Differences between effect of sales in offline and live streaming room on brand image. After comparing the effect of sales in offline stores and live streaming room, there is no difference in means of quality perception, price perception and service perception between selling in live streaming room or selling in offline store. However, the effects are significant on product perception and willingness to purchase. People perceive selling in offline store makes products more luxurious. Willingness to purchase in the live streaming room is higher than that in offline stores. Also, the effect on perception of consumer's social class is significant, confirming that people tend to agree that consumers are more likely to be in upper class while buying products in offline stores. The above information is summarized in Table 3.

**Table 3.** Comparison of Offline Group and Live-streaming Group

Survey Item	Mean of Offline Store Group	Mean of Live-streaming Room Group	T-test
I feel brand's quality is (1=very rough, 7=very delicate)	5.77	6.06	-1.84
I feel brand's product is (1=very economical, 7=very luxury)	6.23	5.45	3.54***
I feel brand's price is (1=very low, 7=very high)	5.63	5.55	0.46
I feel consumers of brand are more likely to be in upper class. (1=strongly disagree, 7=strongly agree)	5.86	5.43	2.10*
How much do you agree brand's consumer will receive honorable service (1=strongly disagree, 7=strongly agree)	5.89	5.71	0.93
My willingness to purchase is (1=very low, 7=very strong)	4.21	5.02	-2.63*

Significance levels: \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

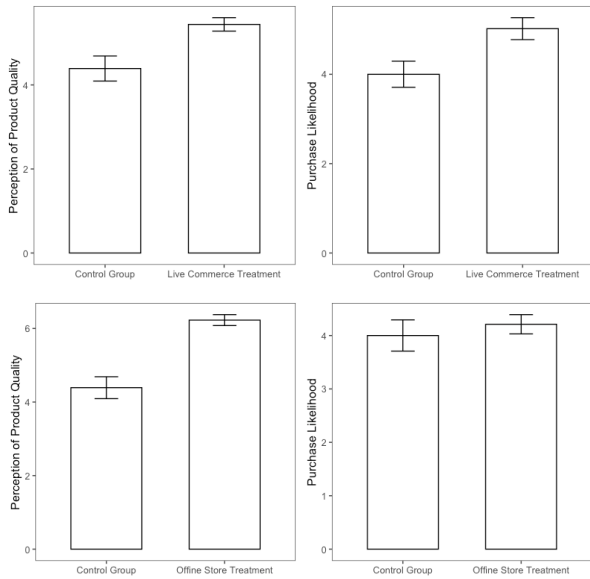


Figure 3 Core Results from Study 1

In conclusion, offline sales convey upper-class perception and elevate product perception, but live streaming sales contribute to purchase likelihood (see Figure 3). Moreover, there is no difference between quality, price, and service perception between offline sales and live streaming sales channel. Therefore, the conclusion of study 1 is that live stream doesn't hurt luxury brand image. In order to study this topic further, study 2 investigates whether the presence of public figures in live streaming room helps with luxury brand image.

### 3. STUDY 2: HOW CAN LUXURY BRAND FURTHER IMPROVE ONLINE SHOP EXPERIENCE AND MAINTAIN BRAND IMAGE?

Through three sets of data, Study 1 demonstrates the overall effect of live commerce on brand image. Offline sales channel contributes to the overall luxury brand image except the willingness to purchase, while online contributes to overall luxury brand image as well as purchase likelihood. There is no difference between quality, price, and service perception between sales in the offline shop and live streaming rooms. But offline shop does convey high social class perception and product quality perception, while live streaming room helps with purchase intention. The mechanism might be that live streaming room increases the accessibility of the products. In study 2, three experiments are conducted to further explore the effect on brand image regarding the public figures appearing in live streaming rooms. Three more surveys are published on the online survey platform, and participants are randomly chosen. First survey serves as the control group. The other two investigations revolve around public figures with good or bad reputation, serving as the treatment groups. These two surveys not only introduce the textual information

of public figures and brand, but also provide the pictures visualizing the scene of sales in live streaming room without streamers for the first survey and sales where public figures are presented for the last two surveys (see Figure 4 and 5). Based on the given information, participants were asked to rate the questions about brand image. The t-test is used to evaluate the differences in data for statistical significance.



Figure 4 Picture of sales in live streaming room without public figure



Figure 5 Picture of sales in live streaming room with public figure

### Result and Discussion

Effect of public figures with bad reputation on brand image. By comparing the collected data, there is no significant effect on all measures of scale. In conclusion, the presence of public figures with bad reputation has no impact on brand image when selling products in live streaming room. The above information is summarized in Table 4.

**Table 4.** Comparison of Control Group and Public Figures with Bad Reputation Group

Survey Item	Mean of Control Group	Mean of Public Figures with Bad Reputation Group	T-test
This brand is expensive. (1=strongly disagree, 7=strongly agree )	4.73	4.79	-0.17
This brand is symbol of high status. (1=strongly disagree, 7=strongly agree)	4.12	4.36	-0.52
This brand leads fashion trends season to season. (1=strongly disagree, 7=strongly agree )	5.08	4.93	0.36
This brand is influential. (1=strongly disagree, 7=strongly agree)	5.46	4.89	1.50

Product is mass-produced. (1=strongly disagree, 7=strongly agree)	4.35	4.93	-1.21
The design of this brand' s product is common. (1=strongly disagree, 7=strongly agree )	3.85	4.07	-0.50
This brand is exclusive. (1=strongly disagree, 7=strongly agree)	5.00	4.64	0.95
Under this situation, my willingness to purchase is (1=very weak, 7=very strong)	4.5	4.5	0

Significance levels: \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .

Effect of public figures with good reputation on brand image. The result reveals that public figures with good reputation contributes to brand image except the common-design perception. There is a significant difference between the means of how much people agree with that brand is expensive, is a symbol of high status, is influential, is exclusive, is a leader of fashion trends, and has mass-produced products. Consumers are also asked to rate their willingness to purchase. Nonetheless, there is no significant effect on how people perceive that the product design is common. The above information is summarized in Table 5.

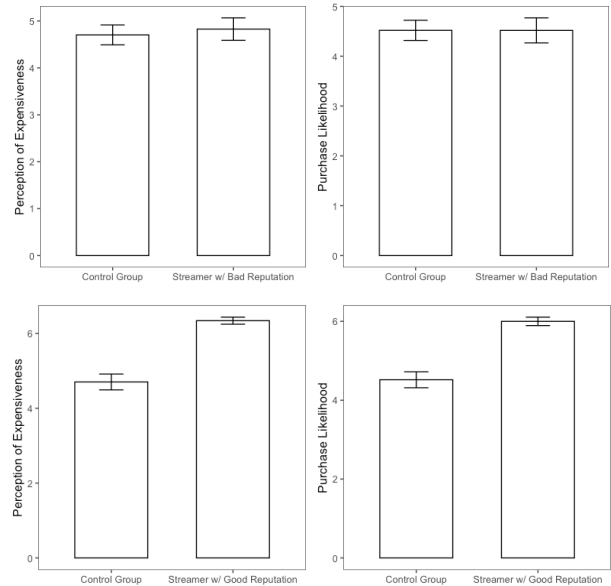
**Table 5.** Comparison of Control Group and Public Figures with Good Reputation Group

Survey Item	Mean of Control Group	Mean of Public Figures with Good	T-test
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		<i>Reputation Group</i>	
This brand is expensive. (1=strongly disagree, 7=strongly agree )	4.73	6.34	- 6.76***
This brand is symbol of high status. (1=strongly disagree, 7=strongly agree)	4.12	5.68	- 4.58***
This brand leads fashion trends season to season. (1=strongly disagree, 7=strongly agree )	5.08	6.32	- 4.04***
This brand is influential. (1=strongly disagree, 7=strongly agree)	5.46	6.21	-2.95**
Product is mass-produced. (1=strongly disagree, 7=strongly agree)	4.35	3.16	2.63*
The design of this brand' s product is common. (1=strongly disagree, 7=strongly agree )	3.85	2.87	2.00
This brand is exclusive. (1=strongly disagree, 7=strongly agree)	5.00	6.26	- 4.85***
Under this situation, my willingness to purchase is (1=very	4.5	6.0	- 6.38***

weak, 7=very strong)			
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Significance levels: \* $p < 0.05$ , \*\* $p < 0.01$ , \*\*\* $p < 0.001$ .



**Figure 6** Core Results from Study 2

The main takeaway is that, having public figures with bad reputation to promote the brand in the live streaming room has no effect on brand image, while the existence of public figures with good reputation in live streaming room promotes luxury brand image but not the common-design perception (see Figure 6).

**4. CONCLUSION**

Live commerce has become an increasingly important sales channel for various brands. This paper studies the effect of live streaming sales on luxury brand image. There is a significant upward trend of live commerce while previous literature presents the controversies of selling luxury products in live streaming room. This paper aims to answer the research question whether live commerce work with luxury brands by designing two studies and collecting survey data from online survey platforms. Study 1 investigates the overall effect that live sales convey to luxury brand image. Study 2 explores the role of public figures on luxury brand image when shopping in live streaming room.

Several crucial findings emerge from data analyses. First, both sales in offline and live streaming rooms can contribute to luxury brand image, but sales in offline stores do not help with the likelihood of purchasing. It is possible that the accessibility of live commerce plays a critical role in this result. With the feature of easy to



access, people from any social class in the society can become familiar with the brand and thus purchase the products. Live commerce provides additional convenience of shopping to consumers. Second, measured brand image is improved when selling products with public figures with good reputation, which is consistent with the literature finding that public figures with good reputation bring positive influence on brand image. However, public figures with bad reputation do not harm luxury brand image. The potential reason is that luxury brand has already been well-known. Most of them have a long history and are designed by top creation executives in the world. Furthermore, luxury brands spend a large percentage of their profits on advertising each year. From a long run perspective, luxury brand image lays a solid foundation. Bad reputation of public figure will not have a long-term impact on brand image of luxury goods.

The study still has some limitations. First, the study will benefit from a larger number of subjects. Second, to further the insights, the second study can benefit from a few more study designs. This study unfortunately failed to do so due to too many invalid data points from two additional study designs: the impact of the neatness of live streaming room and the authority of live platforms on luxury brand image. However, future studies can build on this research and further look into the additional factors that may benefit luxury brands in the live streaming room.

## References

- [1] Greenspan, Sam, et al. (2021), "The 2010s ECommerce and Online Shopping Decade in Review." [jilt.com/blog/decade-ecommerce-2010s/](http://jilt.com/blog/decade-ecommerce-2010s/).
- [2] Daniela Coppola. Statista, (2020), "Global Digital Buyer Reach 2021." [www.statista.com/statistics/261676/digital-buyer-penetration-worldwide/](http://www.statista.com/statistics/261676/digital-buyer-penetration-worldwide/).
- [3] Gartner\_Inc. (2020), "Luxury Brands Double Down on China's Emerging Social Platforms." [www.gartner.com/en/marketing/insights/daily-insights/luxury-brands-double-down-on-chinas-emerging-social-platforms](http://www.gartner.com/en/marketing/insights/daily-insights/luxury-brands-double-down-on-chinas-emerging-social-platforms).
- [4] Fionda, Antoinette M, and Christopher M Moore.(2009) "The Anatomy of the Luxury Fashion Brand." *Journal of Brand Management*, vol. 16, no. 5-6, pp. 347-363., doi:10.1057/bm.2008.45.
- [5] Berthon, Pierre, et al. (2009), "Aesthetics and Ephemerality: Observing and Preserving the Luxury Brand." *California Management Review*, vol. 52, no. 1, pp. 45-66., doi:10.1525/cm.2009.52.1.45.
- [6] Heine, K. (2012). The concept of luxury brands. *Luxury Brand Management*, 1, 2193-1208.
- [7] Keller, Kevin Lane. (2017), "Managing the Growth Tradeoff: Challenges and Opportunities in Luxury Branding." *Advances in Luxury Brand Management*, pp. 179-198., doi:10.1007/978-3-319-51127-6\_9.
- [8] Kluge, P. N., & Fassnacht, M. (2015). Selling luxury goods online: effects of online accessibility and price display. *International Journal of Retail & Distribution Management*, 43(10/11), 1065-1082.
- [9] Gfrerer, Katharina Susanne. (1970), "Does the e-Retailing of Luxury Brands Really Damage Their Brand Image?" NHH Brage
- [10] World Leaders in Research-Based User Experience. "Between-Subjects vs. Within-Subjects Study Design." Nielsen Norman Group, [www.nngroup.com/articles/between-within-subjects/](http://www.nngroup.com/articles/between-within-subjects/).

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