The Influence of Gamification Mechanics on Online Group-buying Participation

Completed Research

Qingsong Ye
Shenzhen University
Lantu271@163.com

Yuanyue Feng[*]
Shenzhen University
yuanyuef@szu.edu.cn

Pianpian Yang
Shenzhen University
yangpianpian2008@hotmail.com

Congcong Yang
Dongguan University of Technology
yangcc@dgut.edu.cn

Lusi Yang
University of Arizona
lusiyang@email.arizona.edu

Abstract

With the surge of social commerce, an increasing number of online group-buying platforms have been established. Gamification is a popular mechanism adopted by such online group-buying platforms to effectively foster consumers' participation. However, there is a dearth of gamification literature that examines the effectiveness of gamification mechanics in the context of online group- buying. This study establishes a model relating two prominent gamification mechanics (i.e., challenge affordance and collaboration affordance) with consumers' participation in online group-buying platforms, which are mediated by relatedness and playfulness. An online survey with 227 samples is conducted on a Chinese group-buying website named Pinduoduo. Using the partial-least-squares structural-equation-modeling (PLS-SEM) method, results indicate that collaboration affordance positively affects relatedness and playfulness which, in turn, motivate consumers to participate. Challenge affordance positively influences playfulness, but not relatedness. Theoretical contributions and practical implications are also discussed.

Keywords

Online group-buying participation; Motivational affordance perspective; Challenge affordance; Collaboration affordance; Relatedness; Playfulness

Introduction

Online group buying has become a trend over the world in recent years. According to data from the China Internet Network Information Center, there are about 656 million mobile phone users in China by 2016, about 30% of which use mobile phone for online group buying, showing broad market prospect and great profit potential in China (Bai et al. 2017). Nevertheless, the development of online group buying platforms was limited by the difficulties in gathering new buyers and retaining existing buyers (Turban et al. 2010), which means the social attributes need to be reinforced. According to the researchers, online group buying is often recognized as a sub category of social commerce (Turban et al. 2010). With the emphasis on social features of online group buying platforms, increasing numbers of companies have applied gamification elements with social features to improve user experience, so as to retain consumers. RetailMeNot, for instance, releases leaderboard for users who earn the most points by sharing coupons information in online communities, as a mechanism to foster social comparison among users.

Gamification is defined as "the use of game design elements in non-game contexts" (Deterding et al. 2011). Generally, extant studies on gamification and especially its practical applications focus on simple game

components, such as points, badges and leaderboards (Bittner et al. 2014). Very little research has addressed the influence of gamification mechanics on users' motivations and behaviors, although researchers have noted that gamification mechanics provides a better solution for user engagement comparing to gamification components (Werbach et al. 2012). In the context of online group buying, the shopping process can be interpreted as a group task with time pressures (Turban et al. 2010), which overlaps with the concepts of two gamification mechanics, challenge and collaboration (Blohm et al. 2013). Individual consumers who initiate group buying tasks need to gather a sufficient number of other consumers to form a group in a limited period of time, so as to enjoy the discounted product price. Such time pressure represents a challenge. And the process of gathering other consumers to purchase the products is in essence a collaboration event. Prior gamification literature has suggested that gamification mechanics can foster users' engagement by affording their intrinsic motivations (Hamari et al. 2016). However, there is a dearth of online group buying research examining the impacts of these two prominent gamification mechanics on users' intrinsic motivations and participation. Without a nuanced understanding, it may be challenging for online group buying platforms to effectively gamify their group buying processes to sustain consumers' participation.

To fill the gap, we develop a research model integrating gamification with online group buying. Grounding on the motivational affordance theory and literatures on intrinsic motivation, we empirically examined the effects of two gamification mechanics (i.e., challenge affordance and collaboration affordance) on two intrinsic motivations (i.e., relatedness and playfulness), which then affect group buying participation. This research contributes to both the gamification and online group buying literatures.

Theoretical Background

Online Group Buying Behavior

Online group buying refers to a number of buyers getting together to reach a certain volume of group size through Internet to get a discount on products (Liu et al. 2015). Researchers have explored and examined the antecedents for online group buying participation from various theoretical lenses. For instance, based on the technology acceptance model (TAM), Tsai et al. (2011) indicated that perceived usefulness, sense of virtual community and trust in virtual community are major determining factors for online group buying intention. Moreover, Shiau et al. (2012) applied the social exchange theory and identified the significant influence of reciprocity, trust, satisfaction, and seller creativity on engaging intention. Chen et al. (2015) extended online group buying literature by classifying influencing factor into social factors (i.e., online recommendations, media recommendations, and personal recommendations), individual factors (i.e., compliance and attention-to-social-comparison-information) and psychological factors (i.e., financial risk, performance risk, and social risk).

Although prior research has unraveled various anecdotal factors for consumers' participation in online group buying, most of these factors are on a rather abstract level thus are unable to offer effective implications for the website design. Hence, recent researchers have solicited more research on the website design (Han et al. 2018). In practice, many online group buying platforms have begun to incorporate various gamification mechanics as design features. However, there is a dearth of research examining the effectiveness of gamification mechanics in the online group buying platforms.

Gamification Mechanics as Motivational Affordance in Online Group Buying

According to the classical Dynamic-Mechanics-Component (DMC) pyramid framework, gamification mechanics is defined as "the basic processes that drive the action forward and generate player engagement" (Werbach et al. 2012). Common gamification mechanics include challenge, collaboration, chances, reward and etc. (Werbach et al. 2012). Researchers have noted the limitation of merely using gamification components (e.g., points, badges, leaderboard, PBL triad), while the usage of gamification mechanics provides a better solution (Werbach et al. 2012). For instance, Bittner et al. (2014) questioned PBLs for their effectiveness of making gamification successful. Similarly, Mekler et al. (2017) mentioned that PBLs may not satisfy the need for competence and relatedness on their own without gamification mechanics such as challenge and team play.

Although there might be many ways in which online group-buying platforms can apply gamification mechanics, the most prominent adoption of gamification is precisely the process of group buying itself. For example, on Pinduoduo, a popular online group buying platform in China, individual consumers who initiate group buying events have to gather a certain number (e.g., 2 to 3) of other consumers with the same product demand in a limited period of time (i.e., one day) so as to enjoy discounted product price. The crux of such online group buying model is to complete a group task with time pressures (Turban et al. 2010). Such logic corroborates with two gamification mechanics: challenge and collaboration (Blohm et al. 2013). Challenge as a gamification mechanics refers to an initiative requiring an individual to achieve a task by overcoming specific obstacles (Poncin et al. 2017), whereas collaboration denotes the process of multiple individuals working together to achieve a common goal (Meske et al. 2016). Gathering a group of consumers in a limited period of time represents a challenge for the group buying initiators, while the group buying activity itself is essentially a collaboration event. Summarized by previous literature, discount strategy, short time duration, and transaction volume requirement are unique features of online group-buying, among which pricing issue has been fully studied by past researchers (Che et al. 2016). Therefore, we choose to focus on challenge and collaboration as two unique features in the present model.

Motivational affordance theory (Zhang 2008) has been utilized to to study the impacts of gamification design on users' motivations and behaviors (Hamari et al. 2014). Affordance was first put forward as the relationships between environment and actor by ecological psychologist Gibson, and can be further explained as "action possibilities that actors have in the environment" (Vugt et al. 2006). When perceived, affordance motivates actors to take actions to satisfy certain need, thus motivational affordance is defined as "the properties of an object that determine whether and how it can support one's motivational needs" (Zhang 2008). It is believed that motivational affordance theoretically links technological features and user experiences together (Suh et al. 2017). In a literature review by Hamari et al. (2014), gamification elements such as points, clear goals and challenge were conceptualized as motivational affordance. Literatures in this review paper followed the logic of "motivational affordance-resulting psychological outcomes-further behavioral outcomes". Hence, we conceptualize challenge and collaboration as motivational affordance in the current study, that is, the perception of the possibilities for participating in challenge and collaboration offered by system design (Suh et al. 2017).

Following the logic of motivational affordance, previous research has examined the effects of challenge and collaboration on users' motivation needs and behaviors. Cheong et al. (2013) showed that gamified tutorial system with challenge mechanics leads to higher engagement and learning outcome than non-gamified system. When it comes to collaboration, Knutas et al. (2014) discovered that a gamified course discussion system for students designed with collaboration mechanics has positive impact on communication efficiency. As can be seen from the literature, challenge and collaboration can afford the intrinsic motivations of the users and change their behaviors in the gamified systems (Hamari et al. 2015).

Relatedness and Playfulness as Intrinsic Motivation

According to the Self-Determination Theory (Ryan et al. 2000), an individual's motivations to execute some behaviors can be divided into intrinsic motivations and extrinsic motivations. Intrinsic motivation refers to autonomous behaviors that are inherently enjoyable without external promotion while extrinsic motivation refers to behaviors performed in order to obtain separable outcome (Ryan et al. 2000). There are three types of intrinsic motivations: autonomy, competence, relatedness (Deci et al. 2002). Autonomy refers to the sense of volition and organizing one's behavior freely (Roca et al. 2008), while the need for competence is the feeling of effectiveness and controlling outcome (Deci et al. 2002). And relatedness concerns with the need of being connected and belonging to others or the community (Roca et al. 2008).

As a typical form of social shopping under the umbrella concept of social commerce, online group buying promotes social interactions among the consumers (Han et al. 2018). The challenge of collaboratively buying the products in a limited time strengthens consumers' need to interact with other consumers. From the literature discussed above, need for social interaction is a repeatedly mentioned antecedent for group buying participation, whereas the needs for autonomy and competence have not been linked with group buying participation. Therefore, in the current study, we select the relatedness from the three innate needs proposed in SDT as the intrinsic motivation afforded by the two gamification mechanics.

Apart from that, playfulness is recognized as intrinsic motivation in some past literature, since its early definition described users' tendency of spontaneous, inventive and cognitive interaction in

microcomputer, which is closely related to intrinsic motivation (Roca et al. 2008). Playfulness was also investigated as an intrinsic motivation for the participation in online group buying (Lim 2014). In addition, past literature has indicated that playfulness is a key intrinsic motivation aroused by gamification design (Lu et al. 2016). Hence, we select the playfulness as another intrinsic motivation.

Research Model and Hypotheses

Drawing on the above literatures on gamification and online group buying, a model is established to explain consumers' participation in online group buying platform as shown in Figure 1. We propose that challenge affordance and collaboration affordance positively affect consumers' relatedness and playfulness which, in turn, positively affect consumers' intention of participating in online group buying.
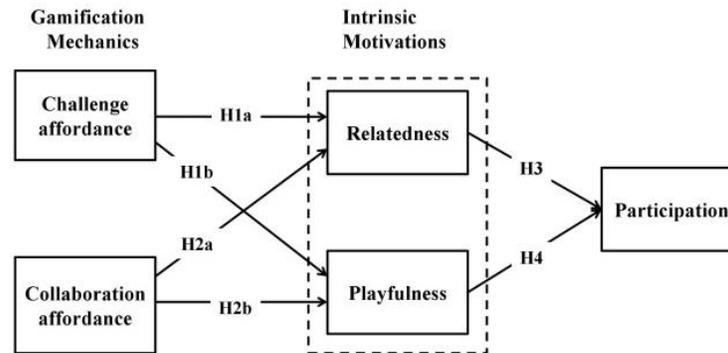

Figure 1. Research Model

Challenge Affordance

As mentioned before, when a consumer faces with the challenge of gathering a group of buyers in a limited period of time, he will seek help from friends in his social networks, so as to complete the group buying task. Hence, individual consumers tend to keep long-lasting reciprocal relationships with a large number of friends who can possibly join in his group buying initiatives. Summarizing this logic, we postulate that the challenge affordance will foster consumers' need for building close and reciprocal relationships with other consumers, that is, need for relatedness with other consumers.

Flow is a state representing the extent of pleasure and involvement in an activity (Csikszentmihalyi et al. 1975). Previous literature has found that challenges in game can increase flow experience (Lucero et al. 2014). Hence, we postulate that the challenge mechanics will also enhance consumers' feeling of playfulness during the online group buying events. From the discussions above, we hypothesize,

H1: Challenge affordance is positively related to perceptions of (a) relatedness and (b) playfulness.

Collaboration Affordance

Shapiro (2013) has found supports for the positive relationship between collaboration and relatedness in video game context. When the rules of online group buying platforms require the initiator to collaborate with others to get the discount, the initiator will be more willing to interact with a large number of consumers in the platform, so as to quickly locate those consumers who are able to join in the event. In view of that, we postulate that collaboration affordance will stimulate consumers' need for relatedness with other consumers in the platform.

Lu et al. (2016) has found that photo co-creation activities (as a form of collaboration) require participants' collective efforts, which enhances playfulness in the workplace. Similarly, online group buying can also be identified as a game design with collaboration, for setting mutual goal and combining concerted efforts during the process. Therefore, the collaboration design of online group buying can as well enhance playfulness. From the discussion above, we hypothesize,

H2: Collaboration affordance is positively related to perceptions of (a) relatedness and (b) playfulness.

Relatedness

Researchers have found that the fulfillment of need for relatedness contributes to interpersonal relationship building and leads to subsequent behaviors, such as the purchase intention in online shopping (Gao et al. 2018). Consumers who experience sense of relatedness with group members may be more willing to participate in online group buying so as to enhance social bonds. Thus, we hypothesize,

H3: Relatedness is positively related to consumers' intention to participate in online group buying.

Playfulness

Prior empirical studies have suggested that playfulness intrinsically motivates an individual's continued use of e-learning system (Roca et al. 2008). Playfulness has been repeatedly found to be related to user's attitude and explorative behavior (Hamari et al. 2015). If buyers feel playful, concentrated and explorative on the platform, it is more likely that they will participate in online group buying. Thus, we hypothesize,

H4: Playfulness is positively related to consumers' intention to participate in online group buying.

We also include gender, age, education level, and monthly income in our model as control variables.

Research Methodology

Empirical data was collected from target population on a famous and fast-growing online group buying platform in China (i.e., Pinduoduo) through online survey. In Pinduoduo, when a group buying is initiated, group forming has to be finished within 24 hours. Only in this way can buyer get the price discount. Therefore, the purchase process in Pinduoduo contains challenge and collaboration mechanics as described in gamification literature (Hamari et al. 2014) making it a suitable context for the present study.

Sample

A link to the survey questionnaire hosted by an online survey platform (www.wenjuan.com) was randomly sent to experienced users of Pinduoduo through invitational private message. Subjects must have registered over half a year and completed at least one group purchase on the platform. 452 users responded by filling out the questionnaires. After deleting invalid responses, a total number of 227 questionnaires were obtained. Demographic characteristics of the usable samples are shown in Table 1.

Measure	Item	Frequency	Percentage (%)
Gender	Male	69	30.4
	Female	158	69.6
Age	<18	30	8.8
	18-24	111	48.9
	25-35	71	31.3
	36-50	22	9.7
	>50	3	1.3
Educational level	Middle school and below	28	12.3
	High school	67	29.5
	University (College)	122	53.7
	Master	9	4.0
	Ph.D.	1	0.4
Monthly Income (CNY)	<2000	114	50.2
	2000-5000	93	41.0
	>5000	20	8.8

Table 1. Demographics Information

Measure

Wherever available, measurements of research variables were adapted from the existing literature. Items for relatedness were adapted from Sheldon et al. (2001), while items for playfulness were adapted from

Moon et al. (2001). Items of intention to participate were adapted from Shiau et al. (2012). Items of challenge affordance and collaboration affordance were developed based on their definitions and past studies. All the items were measured using a 7-point Likert Scale anchored from strongly agree (7) to strongly disagree (1). We invited a professor to translate the English items into Chinese and asked another professor to translate them back to English. The two professors have good command of both Chinese and English. We then compared the two versions of English items and made modifications accordingly.

Results

This study uses Partial Least Squares Structural Equation Modeling (PLS-SEM) to analyze the survey data. Accordingly, PLS-SEM has been widely adopted to estimate conceptual model with latent variables (Hair Jr et al. 2016). We use SmartPLS 2.0 to analyze the survey data.

The Measurement Model

As shown in Table 2, item loadings of each factor (>0.7) satisfied the reliability requirements. In Table 3, the composite reliability and Cronbach's alpha of all the constructs are greater than 0.70, showing good internal consistency (Werts et al. 1974). Convergent validity of the model was measured by AVEs, which are well above the suggested threshold of 0.5 (Fornell et al. 1981). Square root of the AVE was greater than the correlation coefficients on the same row, illustrating strong discriminant validity (Chin et al. 2003).

Items	1	2	3	4	5
INT1	.230	**.856**	.269	.123	.240
INT2	.282	**.836**	.262	.108	.259
INT3	.266	**.810**	.255	.096	.302
CHA1	.251	.224	.224	**.713**	.171
CHA2	.168	-.001	.034	**.892**	.027
CHA3	.223	.090	.063	**.894**	.125
COL1	**.781**	.214	.245	.300	.172
COL2	**.856**	.212	.244	.183	.092
COL3	**.828**	.245	.233	.222	.168
COL4	**.805**	.196	.083	.217	.310
RELA1	.282	.273	**.803**	.114	.322
RELA2	.284	.323	**.744**	.150	.384
RELA3	.263	.385	**.743**	.132	.347
PLAY1	.229	.408	.366	.134	**.732**
PLAY2	.307	.282	.360	.170	**.743**
PLAY3	.213	.358	.392	.142	**.754**
Notes: INT-Intention to participate; CHA- Challenge affordance; COL-Collaboration affordance; RELA-Relatedness; PLAY-Playfulness					

Table 2. Exploratory Factor Analysis Results

Variable	CA	CR	AVE	CHA	COL	INT	PLAY	RELA
CHA	0.86	0.91	0.76	0.87				
COL	0.94	0.96	0.84	0.55	0.92			
INT	0.95	0.97	0.92	0.38	0.59	0.96		
PLAY	0.95	0.96	0.90	0.43	0.60	0.74	0.95	
RELA	0.95	0.97	0.91	0.42	0.62	0.72	0.82	0.95
Notes: Diagonal elements are the square root of the average variance extracted (AVE); CA, Cronbach's alpha; CR, composite reliability								

Table 3. Means, Standard Deviations, Scale Reliabilities, and Inter-Correlations

Hypothesis Testing

Figure 2 below demonstrate the results of hypothesis testing. Challenge affordance exhibits positive, yet not significant influence on relatedness (β = 0.11, p > 0.05), thus H1 (a) is not supported. Consistent with

our prediction, challenge affordance exhibits a positive influence on playfulness ($\beta = 0.14$, $p < 0.05$), hence supporting H1 (b). Consistent with our prediction, collaboration affordance is positively related to relatedness ($\beta = 0.57$, $p < 0.001$), supporting H2 (a). The relationship between collaboration affordance and playfulness is also significant ($\beta = 0.53$, $p < 0.001$), supporting H2 (b). Furthermore, relatedness ($\beta = 0.34$, $p < 0.001$) and playfulness ($\beta = 0.45$, $p < 0.001$) both exhibit positive relationships with users' participation, supporting both H3 and H4. Besides, none of the control variables are significant.
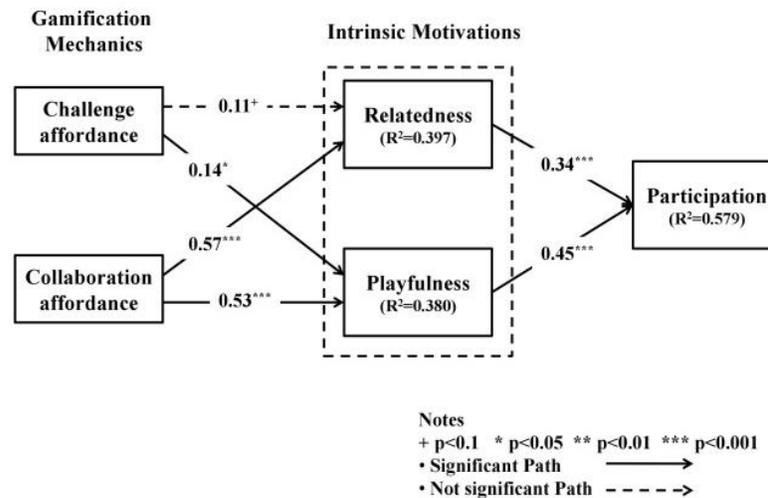

Figure 2. Hypothesis Test Result

Discussions

Empirical results support our hypotheses that collaboration affordance positively affects two kinds of consumers' intrinsic motivation (i.e., relatedness and playfulness), and these two types of intrinsic motivation subsequently positively influence consumers' participation. Besides, challenge affordance positively influences playfulness. However, hypothesis on the effect of challenge affordance on relatedness did not receive support. Crescenzi et al. (2013) demonstrated that time pressure has significant negative influence on distant information seeking. When faced with challenge, mainly through time pressure, consumers may reduce their efforts on seeking for new consumers with similar demand in the platform. Rather, they will seek for help from existing strong social relationships. Consequently, the need for relatedness with new consumers will not significantly increase.

Besides, the path coefficients of challenge affordance on motivations are much less than those of collaboration affordance. This result demonstrates that collaboration affordance might be a more influential factor to motivate participation, as compared to challenge affordance.

Theoretical Implications

This study makes several theoretical contributions. First, we enrich the literature of gamification by specifying the application of challenge and collaboration as gamification mechanics, and subsequently test their impacts on consumers' intrinsic motivation and participation. Moreover, we apply motivational affordance theory to conceptualize challenge affordance and collaboration affordance, which paves the way for measuring users' perceptions on gamification mechanics with scales. Though this research didn't cover all the gamification mechanics, it provides a fresh idea of studying high-level abstract gamification elements (i.e., gamification mechanics).

Second, although past literature has examined the influence of technical factors on online group buying behavior from the perspective of technology acceptance or website characteristics (Che et al. 2015; Tsai et al. 2011), little research has studied the impacts of interaction design and purchase process design. The present study extends previous online group buying literature by empirically validating the impacts of two gamification designs on online group buying behavior.

Third, previous literature has illustrated various antecedents for online group buying behavior, such as price level, trust, cost, word of mouth and so on (Liu et al. 2015). However, little research is made from the perspective of intrinsic motivation. In addition, past studies on intrinsic motivation in gamification context mainly concerned with autonomy, competence and relatedness (Mekler et al. 2017). The current research makes contribution to both fields by taking the specific characteristics of online group buying platforms into consideration, thus extending traditional research pattern of intrinsic motivation and group buying participation intention. The inclusion of perspective of intrinsic motivation also establishes a connection between the domains of gamification and online group buying behavior.

Practical Implications

From a practical point of view, this research provides suggestion for online group buying platform managers on how to encourage consumers' participation intention. Firstly, results suggest that the design of challenge and collaboration mechanics during purchase process may successfully encourage consumers to participate in online group buying. Specifically, managers can strengthen collaboration by improving the requirement of the scope of links sharing, or setting extra rewards along with the size of the group purchase. For mechanism of challenge, managers can highlight the time progress bar and time limitation on purchase interface. Moreover, comparing to challenge, managers should place more efforts to foster collaboration.

Second, results suggest that gamified system could promote consumers' participation in online group buying by intriguing their intrinsic motivations, particularly, the perceptions of relatedness and playfulness. Relatedness and playfulness represent the basic characteristics of online group buying platform as a model of social commerce. Managers should promote the transformation from traditional marketing approach to highlighting the features of user generated content with great reference value, sense of virtual community, active user base and pleasurable usage experience.

Limitations and Future Directions

There are several limitations in the current study. First, this research focuses on Pinduoduo, a Chinese online group buying platform. The subjects of the research are thus limited to users on this Chinese platform, which renders the results vulnerable to cultural influence. Besides, differences on group buying transactions between different group buying models lead to individual behavioral discrepancy (e.g., B2C versus C2C), which also brings up the issue of over-generalization. Future studies can expand the empirical examination to different types of online group buying models with major user groups from different culture backgrounds.

Second, considering characteristics of online group buying platforms, this study focuses on two intrinsic motivations (i.e., relatedness and playfulness), other typical intrinsic motivations such as skill enhancement and curiosity are not included in our model. Future research can discuss and examine the roles of other potential intrinsic motivations between gamification mechanics and consumer participation.

Conclusions

Increasing consumers' participation intention is always a critical issue for online group buying platforms. With the emergence of social characteristic on e-commerce, online group buying firms apply gamification elements to encourage consumers. Results from the study indicate that, though challenge affordance shows insignificant influence on relatedness, the overall findings provide insights for understanding how gamification mechanics influence consumers' participation through intrinsic motivations. This study contributes to future research in areas of online group buying, gamification and motivation.

Acknowledgements

REFERENCES

Bai, B., and Guo, Z. 2017. "The factors affecting the continuance usage behavior of university students towards mobile online group-buying in China," in *2017 3rd IEEE International Conference on Control Science and Systems Engineering (ICCSSE),* Beijing, China, pp. 667-670.

Bittner, J. V., and Schipper, J. 2014. "Motivational effects and age differences of gamification in product advertising," *Journal of consumer marketing* (31:5), pp. 391-400.

Blohm, I., and Leimeister, J. 2013. "Gamification: Design of IT-based enhancing services for motivational support and behavioral change." *Business and Information Systems Engineering* (5:4), 275–278."

Che, T., Peng, Z., and Hua, Z. 2016. "Characteristics of online group-buying website and consumers intention to revisit: the moderating effects of visit channels," *Electronic Commerce Research* (16:2), pp. 171-188.

Che, T., Peng, Z., Lim, K. H., and Hua, Z. 2015. "Antecedents of consumers' intention to revisit an online group-buying website: A transaction cost perspective," *Information & Management* (52:5), pp. 588-598.

Chen, Y. F., and Lu, H. F. 2015. "We‐commerce: Exploring factors influencing online group‐buying intention in T aiwan from a conformity perspective," *Asian Journal of Social Psychology* (18:1), pp. 62-75.

Cheng, H.-H., and Huang, S.-W. 2013. "Exploring antecedents and consequence of online group-buying intention: An extended perspective on theory of planned behavior," *International Journal of Information Management* (33:1), pp. 185-198.

Cheong, C., Cheong, F., and Filippou, J. 2013. "Quick Quiz: A Gamified Approach for Enhancing Learning," in *Pacific Asia Conference on Information Systems 2013*, Jeju Island, Korea, pp. 206.

Chin, W. W., Marcolin, B. L., and Newsted, P. R. 2003. "A partial least squares latent variable modeling approach for measuring interaction effects: Results from a Monte Carlo simulation study and an electronic-mail emotion/adoption study," *Information systems research* (14:2), pp. 189-217.

Crescenzi, A., Capra, R., and Arguello, J. 2013. "Time pressure, user satisfaction and task difficulty," *Proceedings of the American Society for Information Science and Technology* (50:1), pp. 1-4.

Csikszentmihalyi, M., and Csikszentmihalyi, I. 1975. *Beyond boredom and anxiety*, San Francisco, Jossey-Bass.

Deci, E. L., and Ryan, R. M. 2002. "Overview of self-determination theory: An organismic dialectical perspective," in *Handbook of self-determination research*, Rochester, NY: University of Rochester, pp. 3-33.

Deterding, S., Sicart, M., Nacke, L., O'Hara, K., and Dixon, D. 2011. "Gamification. using game-design elements in non-gaming contexts," in *Proceedings of the International Conference on Human Factors in Computing Systems*, Vancouver, BC, Canada, pp. 2425-2428.

Fornell, C., and Larcker, D. F. 1981. "Evaluating structural equation models with unobservable variables and measurement error," *Journal of marketing research* (18:1), pp. 39-50.

Gao, W., Liu, Y., Liu, Z., and Li, J. 2018. "How does presence influence purchase intention in online shopping markets? An explanation based on self-determination theory," *Behaviour & Information Technology* (37:8), pp. 786-799.

Hair Jr, J. F., Hult, G. T. M., Ringle, C., and Sarstedt, M. 2016. *A primer on partial least squares structural equation modeling (PLS-SEM)*, Thousand Oaks, Sage Publications.

Hamari, J., and Koivisto, J. 2015. "Why do people use gamification services?," *International Journal of Information Management* (35:4), pp. 419-431.

Hamari, J., Koivisto, J., and Sarsa, H. 2014. "Does gamification work?--a literature review of empirical studies on gamification," in *2014 47th Hawaii international conference on system sciences (HICSS)*, Waikoloa, HI, USA, pp. 3025-3034.

Hamari, J., Shernoff, D. J., Rowe, E., Coller, B., Asbell-Clarke, J., and Edwards, T. 2016. "Challenging games help students learn: An empirical study on engagement, flow and immersion in game-based learning," *Computers in Human Behavior* (54), pp. 170-179.

Han, H., Xu, H., and Chen, H. 2018. "Social commerce: a systematic review and data synthesis," *Electronic Commerce Research and Applications* (30:5), pp. 38-50.

Knutas, A., Ikonen, J., Nikula, U., and Porras, J. 2014. "Increasing collaborative communications in a programming course with gamification: a case study," in *Proceedings of the 15th International Conference on Computer Systems and Technologies*, New York, NY, USA, pp. 370-377.

Lim, W. M. 2014. "Understanding the influence of online flow elements on hedonic and utilitarian online shopping experiences: A case of online group buying," *Journal of Information Systems*, (28:2), pp. 287-306.

Lister, C., West, J. H., Cannon, B., Sax, T., and Brodegard, D. 2014. "Just a fad? Gamification in health and fitness apps," *JMIR serious games* (2:2), pp. 1-12.

Liu, Y., and Sutanto, J. 2015. "Online group-buying: literature review and directions for future research," *ACM SIGMIS Database: the DATABASE for Advances in Information Systems* (46:1), pp. 39-59.

Lu, D., Dugan, C., Farzan, R., and Geyer, W. 2016. "Let's Stitch Me and You Together!: Designing a Photo Co-creation Activity to Stimulate Playfulness in the Workplace," in *Proceedings of the 2016 CHI Conference on Human Factors in Computing Systems*, San Jose, CA, pp. 3061-3065.

Lucero, A., Karapanos, E., Arrasvuori, J., and Korhonen, H. 2014. "Playful or gameful?: creating delightful user experiences," *interactions* (21:3), pp. 34-39.

Mekler, E. D., Brühlmann, F., Tuch, A. N., and Opwis, K. 2017. "Towards understanding the effects of individual gamification elements on intrinsic motivation and performance," *Computers in Human Behavior* (71), pp. 525-534.

Meske, C., Brockmann, T., Wilms, K., and Stieglitz, S. 2016. "Gamify Employee Collaboration-A Critical Review of Gamification Elements in Social Software," in *Australasian Conference on Information Systems 2015*, pp. 1-13.

Moon, J.-W., and Kim, Y.-G. 2001. "Extending the TAM for a World-Wide-Web context," *Information & management* (38:4), pp. 217-230.

Poncin, I., Garnier, M., Mimoun, M. S. B., and Leclercq, T. 2017. "Smart technologies and shopping experience: Are gamification interfaces effective? The case of the Smartstore," *Technological Forecasting and Social Change* (124), pp. 320-331.

Roca, J. C., and Gagné, M. 2008. "Understanding e-learning continuance intention in the workplace: A self-determination theory perspective," *Computers in human behavior* (24:4), pp. 1585-1604.

Ryan, R. M., and Deci, E. L. 2000. "The darker and brighter sides of human existence: Basic psychological needs as a unifying concept," *Psychological inquiry* (11:4), pp. 319-338.

Shapiro, J. 2013. "Adam's Genesis Game: Parallels of the Motivations Linking the First Man to the Modern Gamer," *Intersect: The Stanford Journal of Science, Technology, and Society* (6:2), pp. 1-16.

Sheldon, K. M., Elliot, A. J., Kim, Y., and Kasser, T. 2001. "What is satisfying about satisfying events? Testing 10 candidate psychological needs," *Journal of personality and social psychology* (80:2), pp. 325.

Shiau, W.-L., and Luo, M. M. 2012. "Factors affecting online group buying intention and satisfaction: A social exchange theory perspective," *Computers in Human Behavior* (28:6), pp. 2431-2444.

Suh, A., Cheung, C. M., Ahuja, M., and Wagner, C. 2017. "Gamification in the workplace: The central role of the aesthetic experience," *Journal of Management Information Systems* (34:1), pp. 268-305.

Tsai, M.-T., Cheng, N.-C., and Chen, K.-S. 2011. "Understanding online group buying intention: the roles of sense of virtual community and technology acceptance factors," *Total Quality Management & Business Excellence* (22:10), pp. 1091-1104.

Tseng, S.-M., and Lee, M.-C. 2016. "A study on information disclosure, trust, reducing search cost, and online group-buying intention," *Journal of Enterprise Information Management* (29:6), pp. 903-918.

Turban, E., Bolloju, N., and Liang, T.-P. 2010. "Social commerce: an e-commerce perspective," in *Proceedings of the 12th International Conference on Electronic Commerce: Roadmap for the Future of Electronic Business*, Honolulu, HI, USA, pp. 33-42.

Vugt, H. C. V., Hoorn, J. F., Konijn, E. A., and de Bie Dimitriadou, A. 2006. "Affective affordances: improving interface character engagement through interaction," *International Journal of Human-Computer Studies* (64:9), pp. 874-888.

Werbach, K., and Hunter, D. 2012. *For the win: How game thinking can revolutionize your business*, Philadelphia, Wharton Digital Press.

Werts, C. E., Linn, R. L., and Jöreskog, K. G. 1974. "Intraclass reliability estimates: Testing structural assumptions," *Educational and Psychological measurement* (34:1), pp. 25-33.

Zhang, P. 2008. "Technical opinion Motivational affordances: reasons for ICT design and use," *Communications of the ACM* (51:11), pp. 145-147.