Article

Strategies for Marketing Really New Products to the Mass Market: A Text Mining-Based Case Study of Virtual Reality Games

Jeffrey C. F. Ho [1,*] and **Xinzhi Zhang** [2]

1   School of Design, Hong Kong Polytechnic University, Hong Kong, China
2   Department of Journalism, Hong Kong Baptist University, Hong Kong, China; xzzhang2@hkbu.edu.hk
*   Correspondence: jeffrey.cf.ho@polyu.edu.hk

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Abstract: This paper reports on a text mining-based case study aimed at determining how virtual reality (VR) games, as examples of really new products (RNPs), market themselves when they are introduced to the mass market. The goal was to examine the marketing foci of RNPs and any subsequent changes over time when the RNPs survive. VR games are a type of RNP offering several unique benefits, such as immersive gameplay and storytelling, which are advanced compared with their earlier counterparts. To examine the marketing foci of VR games, we collected 17,000 pieces of promotional text from a major online gaming marketplace, Steam Store, published from the beginning of the second quarter of 2016 to the third quarter of 2018. We performed text analysis (topic modeling) and found that game marketers paid particular attention to the VR nature of VR games when they first entered the marketplace. However, game content increasingly was emphasized in subsequent quarters. In addition, the marketing foci for VR games seemed to go through an exploratory process, which was not observed among non-VR games in the same period. The results offer insights into how the focus of RNPs' marketing evolves as their newness fades.

Keywords: really new product; digital games; text mining; latent dirichlet allocation; topic modeling; online marketplace

1. Introduction

In an open innovation paradigm, businesses seize various opportunities to introduce their innovative ideas to the market and do so in various forms. One form of such an introduction is launching an innovation as a type of really new product (RNP) to the market. RNPs allow customers to do things that they could not do before [1–3]. While launching RNPs involves marketing the products, little is known about the marketing strategies and promotional foci that businesses adopt when they launch RNPs to the mass market. Very few studies exist in the open innovation literature on whether and how marketers' focus changes if RNPs survive in a market. Thus, understanding the marketing strategies of RNPs would shed light on how businesses attempt to market RNPs at their initial launch and further evolve their strategies once the RNPs have found their place in a market.

This paper reports on a case study on virtual reality (VR) games to examine whether and how marketers of VR games change their focus over a period of 30 months after the VR games' initial entry into the mass market. Although the case study does not offer answers that are applicable to all cases of RNPs, it provides evidence concerning RNPs that contributes to the open innovation literature by offering insights into the marketing aspects of introducing innovation to the mass market.

This study had the following five objectives. The first was to analyze game marketers' promotional descriptions in a large-scale, systematic, and longitudinal fashion via the text-mining method.

The second was to compare the differences in descriptions of VR and non-VR games to examine whether any patterns identified are unique to VR games. The third was to uncover the topics and themes in game descriptions from promotional messages. The fourth objective, taking VR games as a case of RNPs, was to advance the existing knowledge of how RNPs are marketed in the marketplace during their initial introduction and then over the next 30 months. In addition, the study examined whether and how the marketing foci of non-VR games are disrupted by the introduction of VR games. The study's results contribute to the extant literature on RNPs' marketing foci on their initial introduction and whether and how they change over time.

2. Related Works

2.1. Open Innovation and Really New Products

Open innovation is "the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively" [4] (p. 1). The roles of large corporations, small and medium-sized enterprises, universities, and governments are evolving to welcome collaboration, expertise exchange, and facilitation in order to sustain the economy through open innovation [5]. An optimal balance among different parties in a society can support a healthy growth of the economy [6]. In the quaternary economy [7], the advancement of information technology, artificial intelligence, cloud computing, and other cyber technologies becomes a fundamental support for the inflows and outflows of knowledge between companies and stakeholders [8]. For example, the advancement of VR technologies allows for incorporating customer participation early in the innovation process [9,10].

Idea and knowledge management systems can also be used to cumulate ideas and knowledge from employees [8]. From an open innovation perspective, new ideas can come from different parties including businesses, universities, governments, and even social enterprises [11]. Technologies can be useful for harvesting ideas from different sources in order to form collective intelligence. Such collective intelligence has been shown to directly and indirectly enhance the performance of open innovation in certain industries [12].

Most studies on the use of technological intelligence in open innovation have concerned its effects on the innovation process. Very limited attention has been paid to how such technological intelligence can offer insights into the marketing of RNPs. Furthermore, limited attention has been given to trends that develop after the launch of RNPs. One exception is Yun et al.'s [13] simulation study, which highlighted different levels of influence at different stages of maturity of RNPs in different types of industries. In converted industries, such as automobile manufacturing, the business model has a greater influence on the success of RNPs at the early stage, while the focus on technology has a stronger influence at the mature stage. In emerging industries, such as robotics, strategies focusing on technologies have a greater influence at the early stage, while a focus on the business model is more influential at the mature stage.

Businesses can consider different measures to encourage innovation, such as the design of spaces and campuses [14]. Businesses need to nurture an open-innovation-friendly culture with an open innovation strategy and diverse channels for externalizing and realizing innovations because this will motivate employees to become continuous innovators (i.e., serial entrepreneurs) [15]. In such businesses, launching innovations as RNPs is a regular undertaking. Therefore, marketing RNPs becomes a regular task.

Innovative products can be categorized as RNPs and incrementally new products (INPs) [16,17]. RNPs are products that rely on technologies that were previously inaccessible to consumers, thus enabling them to do things that they could not do before [1–3]. INPs are products that add new benefits or improvements to products that currently exist in the market [1,2].

Researchers have been examining how best to communicate RNPs' benefits to customers. They have studied a range of topics from the customers' perspectives, such as how they learn

about RNPs [3,18–20], how they form their preferences for RNPs [16,17,21], and how they decide to adopt them [22]. For example, Feiereisen et al. [21] compared the influences of two presentation formats (text vs. pictures) with two different presentation strategies (analogies vs. mental simulations) on customers' product comprehension and formation of attitudes. Their study included three product types: utilitarian, hedonic and hybrid. Their results suggest that different types of RNPs require different combinations of presentation strategies and formats to achieve an optimal outcome.

Another line of research related to RNPs is product innovation. Researchers have explored the use of various methods, such as VR technologies [9] and narratives [23], for involving customers early in the new product development process. Since RNPs can be a risky investment for a company, researchers are also interested in performance measurements and forecasting RNPs' success [24].

The research community has paid scant attention to RNP marketers' strategies. However, promotional materials that marketers have created for the online marketplace offer an opportunity for researchers to observe their strategies.

2.2. Virtual Reality Games and Online Marketplaces

Although VR technologies have been available since the 1990s e.g., [25], the introduction of consumer-grade VR headsets (e.g., Oculus Rift, HTC Vive) into the mass market in 2016 made VR technology of a decent quality accessible to most consumers. VR technologies have enabled new media forms in several domains, such as immersive journalism [26], VR-based medical and health education [27], and video games [28].

VR game products enable consumers to enjoy a new type of immersive entertainment experience. For example, *Arizona Sunshine* (2016) immerses players in a city scene to fight zombies. *Audioshield* (2016) immerses players in a futuristic environment to play rhythm-matching games. These entertainment experiences were not available in earlier digital games. Thus, VR games were a class of RNPs in the mass market in 2016.

The Internet is one of the major marketing channels for RNPs. In the case of VR games, digital distribution has become a major distribution channel [29]. Online marketplaces, such as Steam Store and Google Play, are crucial sales channels for digital games, and game publishers prepare promotional content for these channels that market their games. These online sales channels are where target customers can be found (i.e., gamers). Each game has its own details page that presents the game's title, an introduction, screenshots, and trailers. This promotional content, especially the text, gives potential buyers an initial idea of the game's content before they actually purchase it. The details page in an online marketplace provides the official presentation of a game, reflecting game publishers' perceptions of key aspects of their VR games.

Furthermore, online marketplaces, such as Steam Store, provide marketing and sales channels for game marketers. Commonly, online marketplaces for games are accessed through mobile platforms [30] and personal computer platforms [31]. Of course, other researchers have studied online marketplaces before. For example, Hamari [32] investigated why players buy virtual goods advertised through free-to-play games.

Steam Store is a marketplace that provides numerous features related to gaming, including a social network for gamers, a platform for sharing screenshots and recordings, and a digital game store. Steam Store is also a popular online marketplace: As of 2014, it was estimated to have 75% of the market share of PC game sales [31]. Even by 2017, when the market became more competitive, game sales through Steam Store reached roughly $4.3 billion, accounting for nearly one-fifth of global PC game sales [33].

Steam Store has been the subject of prior studies. For example, Barbosa et al. [34] proposed using a machine-learning approach to automatically identify the helpfulness of customer reviews, and they used reviewers on Steam Store's site to train their program. Another example is Wui et al.'s [35] text-mining study on customers' reviews of VR games to examine the major aspects of VR games that interest them. Their results show that VR gamers are interested in presence, first-person perspective,

auditory factors, and interaction. However, very limited attention has been paid to the content that marketers create for online marketplaces to shed light on their marketing foci.

2.3. Analyzing Promotional Texts with Web Extraction and Text Mining

Web extraction, or web scraping, refers to the automatic extraction of web-based data using a computer program; it is a technique commonly used for studying online phenomena. Text mining is a set of techniques that extract information from a set of texts (also called a text corpus, or simply corpus) and is a common approach for analyzing a large volume of text data, such as those obtained through web extraction. Text mining has been used in different domains, including digital game research [36].

In a comprehensive review, Berger et al. [37] discuss how text can be useful in marketing research. One major focus of previous studies using web extraction has been users' behavior and their opinions [38–40], both of which leave traces on the Internet, e.g., analyzing customers' complaints to generate insights on their needs and, thus, guide product development [41]. Researchers have demonstrated using text from search engines to forecast sales of new products [42]. For example, text-mining analysis of user-generated content on a travel review website [43] can be used to understand the positioning of hotel brands. Siersdorfer et al. [40] analyzed users' comments on YouTube videos and Yahoo! News stories. They observed that the ratings given to comments can be effective in identifying troll users. Saura et al. [44] analyzed sentiments in Twitter users' comments in response to Black Friday marketing efforts. Text mining of users' reviews can also be undertaken from a longitudinal perspective [45].

Additionally, Berger et al. [37] point out how text can be used to understand organizations. Text can reflect its creator, even if the creator is an organization, e.g., mission statements [46]. Text used in companies' promotional materials, such as ads and websites, can be used to understand many aspects, such as brand personality [47] and orientation toward customers [48].

Previous related works have used the automatic text-mining method to analyze promotional texts. For example, Gassiot and Coromina [49] used text mining to analyze tourism businesses' promotional webpages, whereas Leong, Ewing, and Pitt [50] analyzed business companies' persuasive online themes. During the text-mining process, term frequency (TF)—a type of statistics commonly used in text mining—refers to the number of certain terms' appearances within a text corpus. The TF indicates terms' popularity among the set of texts or documents, thereby reflecting the common concepts represented by terms in a corpus.

Latent Dirichlet allocation (LDA) [37,51] is a common technique in topic modeling. LDA topic modeling automatically identifies topics within a text corpus and from each document. It can be applied across different domains, including education [52]. From an LDA perspective, each document comprises a combination of topics, and a group of terms comprises each topic. The present study investigates which topics the game publishers focus on when presenting their VR games in text.

3. Current Study: A Case Study of Virtual Reality (VR) Games

The current case study's goal is to examine RNPs' marketing foci upon their initial entry into the marketplace and whether and how they evolve over time if they survive in the market. We took VR games as an RNP case and analyzed their text descriptions from Steam Store. This study design was chosen for four reasons.

First, VR games rely on VR headsets (e.g., HTC Vive and Oculus Rift), which offer immersive gaming experiences, and such technology was not available widely to the public before 2016. Thus, VR games qualify under the definition of RNPs [1–3].

Second, marketers of VR games face challenges similar to those of other RNPs. A VR game goes beyond traditional experiences with other media, but due to online marketplaces' current design, game publishers must use traditional media formats (e.g., video trailers, images, and text) to communicate VR games' unique benefits.

Third, the text descriptions of individual games from Steam Store offer opportunities to use longitudinal text-mining to examine VR games' marketing foci. At Steam Store, each game's details page presents the game using text (i.e., the "About This Game" section), screenshots, and trailer videos. These materials offer researchers the opportunity to understand how game marketers think they can best present their VR games' benefits. Each text description is an official presentation of the game, reflecting the game marketer's perceptions and understanding of the game more precisely than screenshots and trailers, as terms appearing in a text presentation are clear descriptions of a game. Furthermore, VR games purchased from Stream Store cover a wide time frame of several years, making possible the longitudinal approach, which is lacking in extant RNP literature.

Fourth, Steam Store is a marketing and sales channel for both VR and non-VR games, making it possible to compare VR games and non-VR games. The comparison would help us reveal whether any detected patterns in VR games' marketing foci are unique to VR games. Furthermore, non-VR games, or digital games other than VR games, rely on existing technologies (e.g., computing equipment for gaming) and offer new elements in each of them (e.g., new game content such as characters, gameplay, and narratives). Therefore, non-VR games can be viewed as a class of INPs [1,2]. The comparison serves as a case study for comparing RNPs and INPs of similar nature (i.e., gaming/entertainment) from the same online marketplace (i.e., Steam Store). In addition, examining the marketing foci of non-VR games allows an examination of whether and how the digital game market, an industry can potentially be converted [13] by the introduction of VR games, responds to the introduction of VR games.

The method adopted in this case study is detailed in the next section.

Method

The authors created a Python script based on the Scrapy framework and extracted content from the Steam Store website. The script obtained text descriptions of items in the Steam Store labeled "Games" [53]. Specifically, the script scanned through webpages of game details from Steam Store. On each game-details webpage, it retrieved the title of a game and the game's text description from the "About this Game" section of the game-details page. The script also created a list of games tagged "VR-only" [54]. For each text description, several processing and analysis steps were performed with an R script. First, the data were converted to lowercase, then non-English characters were removed. Stopwords such as "the" and "will" also were removed, as were extra spaces at the beginning and end of each text description. The analysis calculated TF in the text presentations. LDA topic modeling also was performed.

The current analysis focuses on a period during which several VR games were released. The script was executed on 18 October 2018. Before 1 April 2016, VR games were released infrequently; thus, the current analysis considered games released between 1 April 2016 and 30 September 2018. Game entries with ambiguous release dates (e.g., labeled "Coming Soon") or multiple release dates (e.g., a package of multiple games) were not considered. For comparison purposes, data from non-VR games released during the same period also were collected. In all, 38 games were removed because they either presented only an image in the "About this Game" section or only used non-English text. Altogether, 2211 VR games and 14,789 non-VR games remained in the dataset, for a combined total of 17,000 games.

4. Results

4.1. Term Frequency

Table 1 lists the 20 most popular terms in text presentations of VR and non-VR games. To compare the differences in terms commonly used in the two groups of games, Table 1 also lists how the popular terms in one group of games were ranked in the other group. The overall frequencies of popular terms in non-VR game presentations were higher than in VR game presentations due to the differences in the numbers of games in the two groups in the dataset. The most popular term in both groups was "game."

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Table 1. Twenty most popular terms in text presentations of virtual reality (VR) games and non-VR games.

VR Games				Non-VR Games			
Rank	Terms	Freq.	Rank in Non-VR Games	Rank	Terms	Freq.	Rank in VR Games
1	game	3920	1	1	game	32,028	1
2	experience	1625	30	2	new	10,100	5
3	play	1334	4	3	world	9408	4
4	world	1256	3	4	play	8230	3
5	new	1175	2	5	one	7509	9
6	virtual	1171	743	6	different	7503	12
7	time	1029	7	7	time	7224	7
8	get	934	10	8	players	6314	11
9	one	919	5	9	levels	6268	31
10	mode	916	19	10	get	6185	8
11	players	909	8	11	find	5736	24
12	different	906	6	12	unique	5591	25
13	reality	903	593	13	player	5073	17
14	use	898	21	14	way	5027	18
15	like	815	18	15	games	5001	29
16	weapons	733	32	16	make	4943	20
17	player	730	13	17	story	4927	49
18	way	711	14	18	like	4882	15
19	vive	708	1733	19	mode	4881	10
20	make	691	16	20	enemies	4779	27

Term popularities in the text presentations of VR games and non-VR games were inconsistent: some terms were popular in one group but not in the other. For example, the term "experience" was the second most-popular term for VR games but 30th in non-VR games. The terms related to VR, including "virtual," "reality," and "vive," appeared in the top 20 terms for VR games but were ranked lower than 500th for non-VR games. Several of the 20 most popular terms for non-VR games were related to game content, including "story," "levels," and "enemies;" these were ranked lower than 20th for VR games. For example, the term "story" was the 17th most-popular term for non-VR games but was ranked 49th for VR games. The term "new" was the 2nd most-popular term for non-VR games. On the other hand, the term "new" was ranked 5th in VR games, superseded by terms "game," "experience," "play," and "world."

4.2. Topics

Table 2 lists the topics identified in the text presentations of VR games and non-VR games—10 for each—as determined using LDA topic modeling. Topics were labeled with numbers. The most popular terms of each topic are listed, and similar topics were grouped together for comparison purposes. Four topic categories were identified: "VR" (topics related to VR or immersive experience), "General" (general topics or promotional content), "Gameplay/Game Mechanics" (topics related to game mechanics, such as players, gameplay, and control), and "Game Content" (topics related to content in games, such as challenges, enemies, and weapons).

LDA assumes that each document (in this case, game text presentation) is a combination of topics. The topics identified through LDA are topics that are found in the content of all the documents in a corpus. They contribute to or influence each document in varying degrees. In the current study, the 20 topics were interpreted as the major themes that appeared in the text presentations of VR games and non-VR games.

According to the results of the topic modeling, topics related to general language use, gameplay/game mechanics, and game content appeared in both VR and non-VR games. As can be expected, topics related to VR only appeared in the presentations of VR games.

Table 2. Topics discovered in text presentations of VR and non-VR games.

Topic Categories	VR Games	Non-VR Games
VR	Topic 5: experience, virtual, reality, world, first, real, immersive, life, characters, explore Topic 9: game, vive, htc, content, reality, virtual, may, oculus, full, rift	
General	Topic 4: get, just, make, like, dont, youll, time, youre, one, even	Topic 7: game, just, one, like, get, make, time, dont, want, youll
Gameplay/Game Mechanics	Topic 1: game, mode, play, players, player, score, friends, challenge, arcade, fun Topic 2: game, new, now, games, early, access, please, hands, coming, also Topic 10: time, game, use, level, move, controller, right, levels, movement, around	Topic 1: game, games, gameplay, music, new, unique, experience, graphics, original, soundtrack Topic 5: build, different, game, new, make, world, many, city, get, create Topic 8: game, players, play, mode, player, friends, multiplayer, new, online, team
Game Content	Topic 3: music, play, like, create, different, amp, virtual, enjoy, choose, using Topic 6: weapons, enemies, different, fight, enemy, battle, weapon, combat, use, action Topic 7: world, find, story, puzzles, escape, explore, adventure, magic, room, solve Topic 8: space, city, take, way, control, around, mission, new, fly, planet	Topic 2: enemies, weapons, different, action, fight, use, enemy, unique, special, weapon Topic 3: battle, new, combat, game, strategy, war, battles, different, system, take Topic 4: world, adventure, monsters, new, find, explore, evil, journey, save, characters Topic 6: content, story, may, find, mature, appropriate, work, life, game, adventure Topic 9: space, ship, planet, system, control, must, ships, explore, one, survival Topic 10: game, levels, level, puzzle, time, simple, puzzles, move, achievements, different

4.3. Trend of Topics

Table 3 presents the influence of topics in the text presentations of VR games over time. It lists the numbers and percentages of documents that focused primarily on each topic in each quarter of the years studied. LDA outputted the extent to which a text presentation focused on a topic. Each text presentation had one major topic, the one with the highest weight.

Table 3. Distribution of descriptions of VR games with corresponding topics with the most influence.

Topic	Topic Category	2016			2017				2018			Grand Total
		Qtr2	Qtr3	Qtr4	Qtr1	Qtr2	Qtr3	Qtr4	Qtr1	Qtr2	Qtr3	
5	VR	18 (15.7%)	19 (9.9%)	24 (8.7%)	20 (8.7%)	17 (7.0%)	24 (10.0%)	34 (12.1%)	29 (13.4%)	30 (13.9%)	25 (12.4%)	240 (10.9%)
9	VR	7 (6.1%)	12 (6.3%)	21 (7.6%)	16 (6.9%)	12 (4.9%)	22 (9.2%)	15 (5.4%)	12 (5.5%)	18 (8.3%)	20 (10.0%)	155 (7.0%)
4	General	10 (8.7%)	16 (8.3%)	33 (12.0%)	22 (9.5%)	20 (8.2%)	20 (8.3%)	23 (8.2%)	22 (10.1%)	25 (11.6%)	23 (11.4%)	214 (9.7%)
1	Gameplay	19 (16.5%)	37 (19.3%)	45 (16.3%)	32 (13.9%)	37 (15.2%)	34 (14.2%)	38 (13.6%)	30 (13.8%)	27 (12.5%)	20 (10.0%)	319 (14.4%)
2	Gameplay	6 (5.2%)	16 (8.3%)	15 (5.4%)	11 (4.8%)	14 (5.8%)	6 (2.5%)	13 (4.6%)	9 (4.1%)	9 (4.2%)	8 (4.0%)	107 (4.8%)
10	Gameplay	8 (7.0%)	15 (7.8%)	14 (5.1%)	17 (7.4%)	20 (8.2%)	22 (9.2%)	18 (6.4%)	10 (4.6%)	14 (6.5%)	14 (7.0%)	152 (6.9%)
3	Game Content	11 (9.6%)	14 (7.3%)	19 (6.9%)	29 (12.6%)	20 (8.2%)	14 (5.8%)	23 (8.2%)	18 (8.3%)	15 (6.9%)	14 (7.0%)	177 (8.0%)
6	Game Content	11 (9.6%)	30 (15.6%)	59 (21.4%)	43 (18.6%)	49 (20.2%)	51 (21.3%)	56 (20.0%)	33 (15.2%)	43 (19.9%)	32 (15.9%)	407 (18.4%)
7	Game Content	14 (12.2%)	15 (7.8%)	27 (9.8%)	28 (12.1%)	32 (13.2%)	22 (9.2%)	39 (13.9%)	33 (15.2%)	23 (10.6%)	26 (12.9%)	259 (11.7%)
8	Game Content	11 (9.6%)	18 (9.4%)	19 (6.9%)	13 (5.6%)	22 (9.1%)	25 (10.4%)	21 (7.5%)	21 (9.7%)	12 (5.6%)	19 (9.5%)	181 (8.2%)
	Grand Total	115	192	276	231	243	240	280	217	216	201	2211

Topic 5—concerning VR and immersive elements—was the second most-popular topic in the second quarter of 2016 (15.7%). In the following four quarters, its popularity decreased gradually to make it the third least-popular topic in the second quarter of 2017 (7.0%). A Mann–Kendall test on the popularity of Topic 5 in the first half of the study period supports a decreasing trend ($z = -2.20$, $n = 5$, $p < 0.05$). The popularity increased again at a steady level (between 12.1% and 13.9%) in the first three quarters of 2018. In contrast, since the third quarter of 2016, the popularity of game content-related topics increased. Topic 6, which concerns game content (weapons and enemies), gradually became the most popular topic in the fourth quarter of 2016 and remained as the most popular topic through the end of the study period (ranging from 15.2% to 21.4% in each quarter). Mann–Kendall tests run on the popularity of the 10 topics in the first and second halves of the study period did not show significant increasing or decreasing trends except for Topic 5 in the first half of the study period, as mentioned above.

The graphical representation presented in Figure 1 visualizes the overall pattern of the change of focus. In the first three quarters, topic 6 increased to become the most popular topic. The popularity of topic 5 gradually dropped across the study period. These findings are consistent with the statistical analysis. The lines representing topics related to game content (topics 3, 6, 7, and 8) show zigzag patterns, which indicate fluctuations in popularity across the 30 months. The topics related to gameplay (topics 1, 2, and 10) show a trend of some sudden drops and spikes. The popularity of topic 5 (related to VR) gradually decreased until the second quarter of 2017 and gradually increased again.
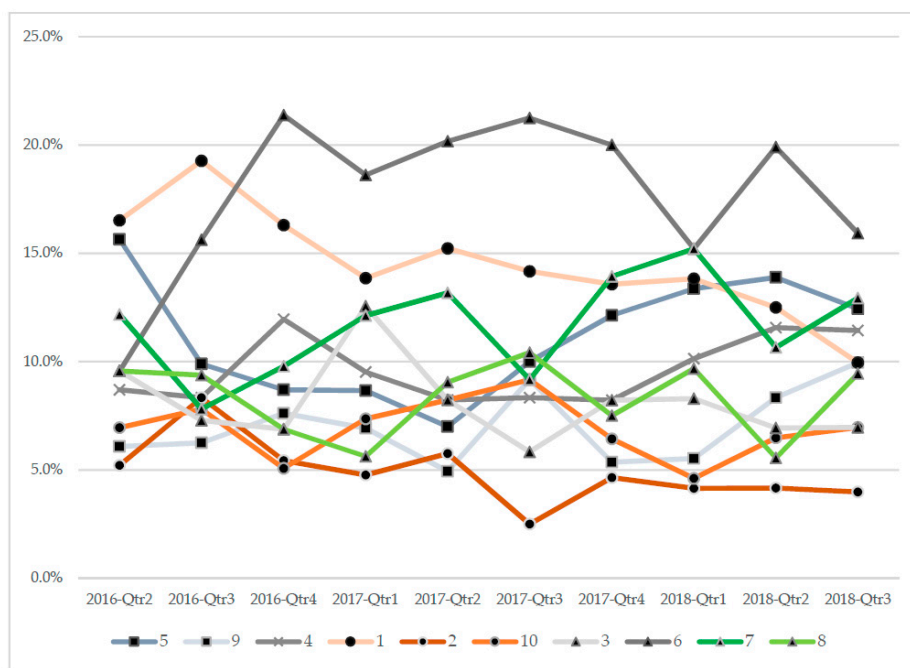

Figure 1. Line chart showing proportions of VR game descriptions most influenced by different topics from 1 April 2016, to 30 September 2018. Lines belong to the same category are denoted with markers of same shapes: squares for VR; crosses for general; circles for gameplay; and triangles for game content.

The statistics for non-VR games, shown in Table 4, show the influence of topics for non-VR games. Topic 6 (concerning game content and story) increased its popularity in the first half of the study period, from the second quarter of 2016 to the second quarter of 2017. A Mann–Kendall test on the popularity of Topic 6 supports an increasing trend in this period ($z = 2.20$, $n = 5$, $p < 0.05$). Topic 8 (concerning gameplay and play mode) seems to drop in popularity in the first half of the study period. Mann–Kendall tests run on the popularity of the 10 topics in the first and second halves of the study period did not show significant increasing or decreasing trends except for Topic 6 in the first half of the study period, as mentioned above.

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Table 4. Distribution of descriptions of non-VR games with corresponding topics with the most influence.

Topic	Topic Category	2016			2017				2018			Grand Total
		Qtr2	Qtr3	Qtr4	Qtr1	Qtr2	Qtr3	Qtr4	Qtr1	Qtr2	Qtr3	
7	General	55 (6.1%)	82 (7.8%)	84 (7.4%)	77 (7.2%)	77 (7.7%)	150 (8.6%)	166 (9.2%)	167 (8.7%)	190 (9.4%)	182 (8.5%)	1230 (8.3%)
1	Gameplay	93 (10.3%)	117 (11.2%)	115 (10.1%)	112 (10.5%)	75 (7.5%)	128 (7.3%)	134 (7.5%)	133 (6.9%)	165 (8.2%)	133 (6.2%)	1205 (8.1%)
5	Gameplay	68 (7.5%)	58 (5.5%)	96 (8.5%)	65 (6.1%)	71 (7.1%)	125 (7.2%)	128 (7.1%)	148 (7.7%)	161 (8.0%)	146 (6.8%)	1066 (7.2%)
8	Gameplay	113 (12.5%)	128 (12.2%)	139 (12.2%)	112 (10.5%)	102 (10.2%)	170 (9.8%)	165 (9.2%)	188 (9.8%)	195 (9.6%)	196 (9.1%)	1508 (10.2%)
2	Game Content	126 (13.9%)	119 (11.4%)	129 (11.4%)	131 (12.2%)	132 (13.2%)	232 (13.3%)	224 (12.5%)	259 (13.5%)	260 (12.8%)	272 (12.7%)	1884 (12.7%)
3	Game Content	67 (7.4%)	77 (7.4%)	75 (6.6%)	90 (8.4%)	77 (7.7%)	133 (7.6%)	131 (7.3%)	110 (5.7%)	119 (5.9%)	160 (7.4%)	1039 (7.0%)
4	Game Content	115 (12.7%)	114 (10.9%)	143 (12.6%)	135 (12.6%)	118 (11.8%)	187 (10.7%)	201 (11.2%)	218 (11.4%)	195 (9.6%)	227 (10.6%)	1653 (11.2%)
6	Game Content	110 (12.2%)	149 (14.2%)	173 (15.2%)	165 (15.4%)	179 (17.9%)	211 (12.1%)	238 (13.3%)	246 (12.8%)	254 (12.5%)	344 (16.0%)	2069 (14.0%)
9	Game Content	74 (8.2%)	97 (9.3%)	81 (7.1%)	73 (6.8%)	85 (8.5%)	124 (7.1%)	116 (6.5%)	124 (6.5%)	139 (6.9%)	130 (6.1%)	1043 (7.1%)
10	Game Content	83 (9.2%)	106 (10.1%)	101 (8.9%)	110 (10.3%)	86 (8.6%)	282 (16.2%)	293 (16.3%)	327 (17.0%)	346 (17.1%)	358 (16.7%)	2092 (14.1%)
	Grand Total	**904**	**1047**	**1136**	**1070**	**1002**	**1742**	**1796**	**1920**	**2024**	**2148**	**14,789**

Figure 2 presents a graphical representation of the changes in topics. In general, the lines do not show sudden drops or spikes (except topics 6 and 10). Topics 6 and 10 (both related to game content) were the two most popular topics. Initially, the popularity of topic 6 (about story and adventures in game content) gradually increased until the third quarter of 2017. Then there was a sudden drop. At the same time, topic 10 experienced a sudden jump and became the most popular topic in the second half of the study period.
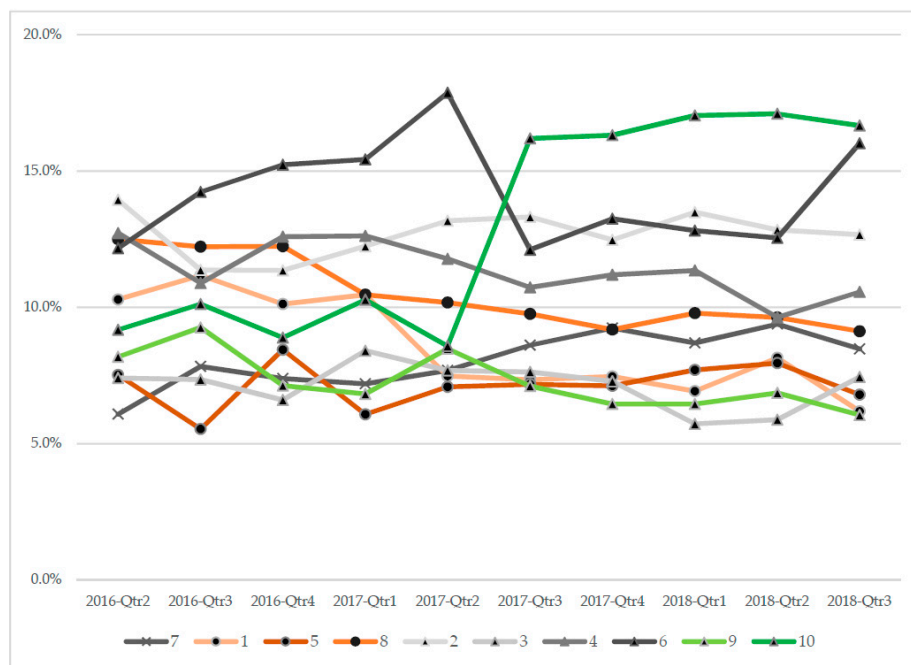

Figure 2. Line chart depicting proportions of non-VR game descriptions most influenced by different topics across time. Lines belong to the same category are denoted with markers of same shapes: crosses for general; circles for gameplay; and triangles for game content.

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Compared with the overall patterns for VR games (Figure 1), the overall change of topics for non-VR games was smoother. Except for topics 6 and 10, the popularity of topics was relatively stable across the study period.

5. Discussion

The exploratory text mining revealed patterns in the different presentations of VR and non-VR games at Steam Store. In terms of term frequencies, the differences among the 20 most popular terms used in text presentations of VR and non-VR games are about VR. The marketing for VR games focused on the VR nature—that is, the newness aspect of these RNPs. The topic-modeling results also reveal that VR games have their own topics relating to VR. The longitudinal perspective reveals an interesting pattern of a shift in marketing focus over time. The topic related to VR and immersiveness was the most popular topic at the beginning of the study period. However, the frequency of highlighting the "VR nature" in VR game descriptions gradually decreased until the middle of the study period. During the same period, the popularity of game content increased and became the most popular topic.

Comparing VR and non-VR games, the change in marketing foci for VR games fluctuated much more than that for non-VR games. This suggests that since VR games were a type of innovation new to the market, those marketing them were exploring their marketing strategies. This may be a necessary process before a norm can be reached. However, the majority of the marketing foci of non-VR games did not show major changes over the study period. This may be because there are some standard ways of marketing non-VR games.

Among the marketing foci of non-VR games, no immediate disruption was observed at the time when VR games were introduced (i.e., the beginning of the study period). This suggests that competitors in the existing market may not respond immediately. The major change in the popularity of non-VR games' marketing focus was the sudden swap of the most popular topics (between topics 6 and 10) in the middle of the study period. There is limited information to suggest how the sudden swap relates to the introduction of VR games to the market. It may be due to other factors in the gaming market.

As the VR and immersiveness that VR games offer are what makes them unique, VR game marketers would be expected to make such a topic the primary focus of promotional materials. However, the data show that a VR-related topic did not remain the most popular—in fact, it became one of the least popular topics in the middle of the study period. The increasing popularity of topics regarding game content during the same period may indicate that the focus had shifted from the VR nature of VR games to their game content. Following this logic, game marketers might have gradually shifted the focus of their marketing strategies from highlighting the VR nature of VR games to highlighting the game content, similar to non-VR games. Thus, their strategies for competing with other games became similar to those of non-VR games (topics regarding game content are popular with non-VR games).

An alternative explanation of the observed pattern is that marketing strategies shifted to presenting the immersiveness and VR nature of VR games through other media formats, such as screenshots and video game trailers. The current dataset only covers textual descriptions and does not provide insights into other marketing through media content. Nevertheless, the textual description of a game on a popular official sales channel should include the game publisher's or maker's official description of the product. Berger et al. [37] suggested that text can be a reflection of the producer. To a certain extent, official descriptions should reflect which aspects of the games marketers want to highlight; therefore, we believe that the first explanation is more promising than the second.

Implications and Contributions

The initial focus on the VR nature of VR games in marketing materials implies a mechanism of competition for RNPs. When a class of RNPs initially enters a market (e.g., VR games entering the mass market), it is competing with existing products; therefore, the promotional materials focus on the

uniqueness of the RNPs' newness (e.g., VR games' immersiveness). When the market for RNPs grows, the individual products in the class of RNPs compete with each other. Consequently, their promotion begins to focus on new elements of individual products (e.g., game narratives). The new focus is similar to that of INPs, as shown in non-VR games' foci.

Yun et al. [13] showed a shift in the influence of business models and technologies as the markets of two types of industry grow. The current case study provides an example of shifting foci in marketing innovation to the mass market—that is, a shift from focusing on the uniqueness of the whole class of RNPs (e.g., VR nature) to the newness of an individual product (e.g., game content). The VR games' marketing strategies shifted to be similar to that of non-VR games. The marketing foci of RNPs present an interesting pattern. When RNPs initially enter a new market, their promotional strategies focus on their unique feature among the whole class of products (i.e., the VR nature of VR games). When the RNPs survive in the market, the focus of their marketing shifts to new elements of individual products (e.g., game content). This shift in focus suggests that the RNPs have become a class of INPs. The fluctuation of marketing foci found in VR games, but not in non-VR games, suggests that this is an exploratory process.

For businesses adopting the open innovation paradigm, such exploration of proper or effective marketing strategies may be something to be expected on the introduction of innovation to the marketing. A constant collection of intelligence with information technologies (e.g., the adoption of text-mining methods shown in the current study) would help businesses adjust and react in their marketing foci [55]. As the current case study suggests, the exploratory process may take months to years. The findings contribute to the open innovation literature by offering a longitudinal view of the survival of RNPs and the exploratory nature of their marketing foci.

The results also provide insights for understanding marketing shifts when the class of RNPs is a new media format (e.g., 3D films, VR games). The findings suggest the sign that a new media format is maturing is when the market focus shifts toward content. Game marketers are becoming less focused on highlighting the VR nature of VR games in their promotions and more focused on game content, similar to how game marketers promote non-VR games.

The result offers practical implications as well. The VR game market has become increasingly competitive: In the second quarter of 2016, only 115 VR games were released on Steam Store, but the number of VR games released per quarter has totaled more than 200 since the last quarter of 2016. More VR games are expected to be released in the future. As such, VR game publishers are expected to face an increasingly competitive market. They will need to differentiate their VR games not only from other types of games but also from other VR games. Therefore, VR game marketers may shift their focus away from VR properties. To marketers of any new media formats, the results suggest that focusing on the newness of RNPs is not enough to succeed in the market: The new element of each product is crucial.

6. Conclusions

The current study investigated the patterns in text presentations of VR games in an online marketplace, as well as changes in the patterns over time. The results demonstrated that the VR properties of VR games initially were a major marketing focus in the text presentations, but that focus eventually seems to have shifted to game content. Viewing VR games as RNPs, this shows evidence of a longitudinal view that the marketing focus of a class of RNPs may focus on its uniqueness upon initial introduction and may shift from uniqueness to the new elements of each individual product as the newness of the class of RNPs fades over time. In addition, the marketing strategies of RNPs may go through an exploratory process after months or years of its initial launch.

One major limitation of the current study is that the data and statistical tests do not show clear and strong support for every pattern we mentioned. We understand that this implies that our results cannot be conclusive. We conducted the current case study to explore how a type of RNP enters a market and how patterns in marketing focus change over time. Thus, we view the case study as being

exploratory in nature. We hope that the observed patterns can offer insights and inspiration for further investigations into how RNPs with innovative technologies emerge in the mass market. The current study covered VR games released over a period of 30 months, in which the results offer a longitudinal perspective on marketing strategies for a class of RNPs. The success and failure patterns of multimodal technologies entering the mass market can imply financial momentum that certain RNPs can receive. Such financial momentum could influence the further development of such RNPs and their influence in the mass market. Examining such patterns is important to understanding the potential impact of product innovation. We believe that the longitudinal approach deserves more attention from the research community than it has received to date.

Further examinations are needed in the future. The current case study only focused on text presentations. Future research might expand the input to include VR game screenshots and trailers. Furthermore, the present study only focused on English texts. Further studies can consider more advanced analysis in multi-lingual and multicultural settings.

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