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Towards Sustainability in Viral Marketing with User Engaging Supporting Campaigns

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Abstract: While viral marketing has captured substantial academic and professional interest, the processes that underpin successful viral marketing campaigns remain poorly understood. High competition and pressure for successful campaigns lead to strategies based on persuasion, unsolicited messages, and other techniques that negatively affect brand perception. The need for more sustainable strategies with a limited negative impact on web users is observed. Therefore, the current study examines the effectiveness of viral marketing and a supporting campaign, where the main goal was to increase user engagement and overall campaign performance. Supporting campaigns were evaluated, to determine whether they enhanced viral activity, but without the need for high persuasion or intrusive techniques. Results showed that supporting actions could be integrated with lower performing campaigns to increase their effectiveness. Apart from the main scientific goal that is presented, the study demonstrates how virtual worlds can provide a laboratory-like environment for identifying the processes that underpin viral marketing.

Keywords: viral marketing; word of mouth; sustainability; social influence; seed selection; virtual world; online marketing

1. Introduction

Growing competition and pressure on electronic media attract more and more attention from marketers. The negative effects of intensive marketing campaigns are observed through the intrusive marketing content [1], advertising clutter [2], and highly persuasive messages leading to advertising content avoidance [3]. Viral marketing based on dissemination of information about products or services within social networks [4] can bypass the advertising avoidance behaviors that are reducing the cut-through of traditional mass marketing methods [5]. It capitalizes on the trust embodied in an individual's social network, as individuals are more likely to attend to and forward messages that have been sent within their social network [6–8]. Research in this field draws explicitly on an epidemiological understanding of how diseases spread through populations [9–11], and it is targeted for the identification of factors affecting the dynamics of the campaign [12] and modeling spreading processes [13]. Seeding strategies based on the selection of initial members of the target group are investigated [14]. Campaign performance and overall results are analyzed in terms of coverage represented by the proportion of the network researched by messages, spreading characteristics over time, sales growth, and the ability to reach users from target groups [14]. Electronic media make possible precise campaign monitoring what was showed for large scale viral campaigns based on the propagation of information about products offered by a leading e-commerce platform [12].

Despite the inherent advantages of viral marketing, negative effects are observed when electronic recommendations are treated as spam messages, especially when they are repeated [12]. Incentives increase the intensity of campaigns, but they may result in lower social influence because of a poor relationship between the sender and recipient [15]. Messages that are redirected with a high intensity can be perceived as unsolicited spam messages [16]. Companies try to influence campaigns with a lower dynamic, to increase their performance. The risk of negative effects requires searching for more sustainable solutions with the ability to attract customers' attention and increase engagement without a negative effect on user experience. Successful campaigns are characterized by user engagement and a growing demand for the product [17]. A viral campaign that is designed incorrectly can be converted from a successful project towards a negative campaign. Tracking customer satisfaction is important because satisfied consumers generate positive word of mouth communication [18], while dissatisfied consumers can generate negative word of mouth messages, thus affecting brand perception [19]. The high intensity of unsolicited messages makes recipients suspicious of incoming messages, and viral marketing campaigns should be designed in such a way that they cannot be classified as typical unsolicited messages [13]. Then, the question is how companies can support viral campaigns without increasing its intrusiveness and how they can rebuild user interest in the case of initial failure or low dynamics. Increasing the value of incentives cannot be the main strategy for increasing results because it works only up to specific levels; anything above that will show a decrease in results [20].

Our earlier work was based on more theoretical aspects of improving the coverage of viral marketing campaigns through sequential seeding [21], dynamic rankings [22], supporting seeding [23], and mixture-based seeding [24]. Here, we assume the increase of dynamics of a primary campaign with the use of supporting campaigns. The purpose of the research was an empirical study and verification of intervention strategies based on supporting campaigns that increase the user engagement within a virtual world. Due to synchronous communication virtual worlds and multiplayer games are similar to real life activity. They can be used as experimental environments and enable the verification of new approaches to examining the complex behavioural patterns that underpin the transmission and the spread of infective diseases [25,26]. Virtual worlds allow for individuals to interact with others through avatars or virtual personas. The nature of these interactions tends to vary as a function of the virtual world's purpose [27].

Thus, this study examines a viral marketing campaign that was conducted in a virtual world to promote a package for customising the appearance of a user's avatar. The main assumption is based on increasing user engagement, instead of increasing the intensity of campaigns with incentives towards more sustainable solutions, without negative effects due to a high number of incoming messages. A virtual world was used as an environment that provided an opportunity to measure or control all of the factors that could influence the dissemination of viral marketing content. The remainder of this paper is structured as follows. Firstly, the literature on viral marketing and virtual worlds is discussed, as well as the points that represent possible areas of convergence between these two recent phenomena. Next, a conceptual framework for supporting campaigns is presented, followed by empirical results and a case study that is based on a viral marketing campaign conducted within a virtual world. Managerial and theory-building implications arising from this case analysis were then discussed.

2. Materials and Methods

Most of the earlier theoretical studies in the area of viral marketing were focused on the initialization of campaigns without any further support during the information spreading process. While in real campaigns various techniques are used for increasing campaign dynamics, further research in this field is required in the case the campaign delivers lower than expected results. The main goal of this research is to evaluate the effect of supporting campaigns based on other processes than the primary campaign. The main assumptions for research were not the use of supporting seeding within

the same campaign, but rather launching additional campaigns, where the main goal is to increase the dynamics of the primary campaign. Figure 1A shows a typical situation when the primary campaign (PC) was initiated by the number of seeds equal to s_0. The number of infections for each analyzed period was growing until T_1 and is reaching the maximal number of infections per period denoted by I_1. Then, the campaign loses its dynamics and the number of infections for following periods dropped. Figure 1(A1) shows an incremental chart, with the total number of infected nodes within the network being represented by coverage C_1.

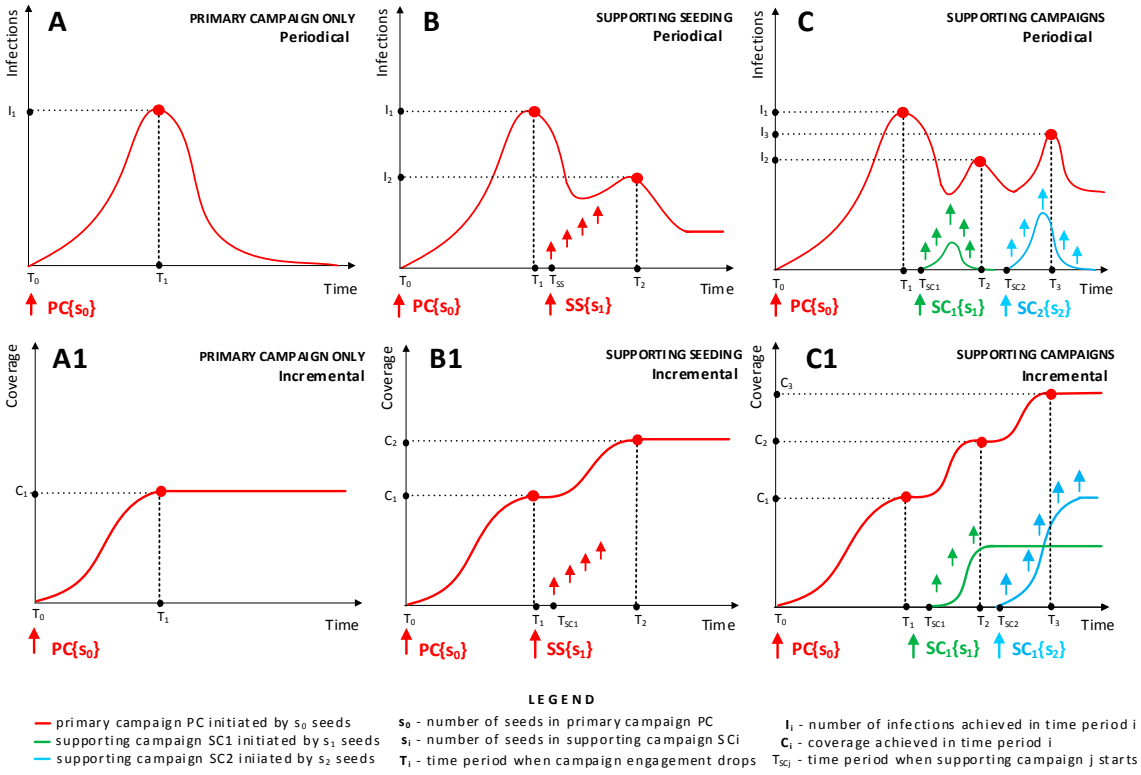

Figure 1. Viral marketing strategies based on primary and secondary campaigns.

In the case of dropping campaign dynamics, additional supporting seeds can be used, as discussed in [23]. Supporting seeding within the same campaign is presented in periodical charts in Figure 1B, and with an incremental representation in Figure 1(B1). When the dynamics of the campaign drop in the period T_1, additional seeding takes place to support the seeding process, which is denoted by SS, and with the number of supporting seeds equal to s_1. The number of supporting seeds can be lower, equal or higher than those used when the primary campaign was initiated. Supporting seeding uses the same (or similar) content like within the primary seeding. In general, it can be a reason for the low effectiveness of supporting seeding, due to a wearing-out or habituation effect that is discussed for various forms of marketing. Another problem can be related to the increased intensity of a campaign, which can result in a negative response, due to a perceived high number of unsolicited messages. In the case of using incentives within supporting seeding, negative effects can be observed, and these are related to low social ties between senders and recipients. To overcome the above effects and strive towards a more sustainable solution without negative effects on user experience, this paper proposes an approach that is based on supporting campaigns and other marketing content than within the primary campaign. The objective is to increase user engagement without intrusive forms of marketing. A strategy based on the supporting campaign is illustrated in Figure 1C, with the supporting campaign SC_1 being initiated with the use of s_1 seeds after the drop of interest in the primary campaign PC in the period T_1. Incremental representation based on coverage is presented in Figure 1(C1). If the supporting

campaign has a positive effect on the primary campaign, then it increases its dynamic, and this is observed in period $T_{2,}$ with the number of infections being equal to I_2. Supporting campaigns can have effects that are limited by time, and other supporting campaigns can be initiated to improve the primary process characteristics. It is illustrated with the supporting campaign SC_2 initiated by the number of s_2 seeds with a positive effect on the primary campaign, and growth observed in period T_3. The next section shows the empirical validation of the presented approach, and results from experimental campaigns are performed within a virtual world.

3. Results

Designed experiment centres in a virtual world that allows for users to interact with each other and engage in online games and other forms of entertainment. The virtual world was based around a 'freemium' business model [28], whereby access to the world is free, but where users can elect to purchase more advanced features using mobile phone-based microtransactions. For example, all of the users have some scope to customise the appearance of their avatars, but those wishing to create an avatar with a unique appearance could do so by purchasing special VIP avatar packs. Moreover, while all the users could meet in public rooms, users had the option to purchase and furnish private rooms in which their avatars could congregate. Users had access to virtual goods for various purposes and transactions were based on purchasing intentions discussed in earlier studies related to virtual goods sector [29]. Analysis of previous attempts to promote premium content in the virtual world suggested that the perceived value of this content decreased, due to the number of people to whom this content was made available. In other words, users appeared interested in purchasing premium content that could further differentiate their avatars, but only when that premium content was deemed comparatively unique (i.e., not widely available). It was confirmed in earlier studies that game mechanics create demand for virtual goods [30]. As a result, premium content that had been advertised using mass announcements within the virtual world resulted in a spike in purchase activity that quickly dissipated. To address this issue, several viral marketing campaigns aimed at stimulating interest in a new form of premium content were initiated and discussed in our earlier work [31]. It showed the potential of increasing interest in virtual goods with the use of viral mechanics.

Presented in this paper results are based on other experiments organized in the form of primary and supporting campaigns. The data collection process within the platform is in compliance with the law and ethical standards. Each user of the platform agreed to the Terms of Use, stating that the platform operator is permitted to collect the data for scientific and analytical purposes. Research is based on anonymized data with encoded user information. The new premium content, presented in the form of special effects, allowed for users to reduce the height of their avatar so that it could be in accordance with other avatars. This was the first time that a modification of avatar height had been made available in the virtual world, and this sparked considerable interest among other users. However, users could only gain access to the premium content by enacting a specific sequence of events. This means that users had to: (i) go to special rooms within the virtual world; (ii) know the password to gain access to those rooms; and, (iii) purchase the content within those rooms, using a mobile phone-based payment. No information about the location of the rooms or the password for accessing those rooms was disclosed, either in official announcements made in the virtual world or by support staff. Thus, the only way that users could access the content was if they were given this information by other users who had already received it. In this way, information about how to access the premium content was governed by a viral marketing process.

Information about the location of the premium content was initially seeded with a small number of users across three mutually exclusive and exhaustive behavioral segments within the virtual world. One segment comprised of those who had previously purchased premium content within the virtual world (i.e., invested users). A second segment comprised of those who had logged in to the virtual world more than 100 times, but who had yet to make a purchase (i.e., engaged users). The third group

was made up of users who had neither purchased premium content nor logged into the virtual world more than 100 times (i.e., casual users).

Interactions within the virtual world were restricted to one-on-one chat messaging. Mentions of the password for accessing the premium content within these chat messages were therefore recorded to ascertain how the information about the location of the premium content spread among users in the virtual world. It was not possible to record message transmission offline by the users or with the use of other communication platforms. However, the number of communication abilities within the platform and user focus on in-chat communication is sufficient to assume that it was happening very rarely. In this way, the number of users who received information about how to access premium content (i.e., infections) and the number of users who disseminated this information to other users (i.e., transmissions) could be ascertained. The number of users who purchased the premium content was also recorded. Thus, information was collected about the number of infections, transmissions, and purchases of the premium content over time. User engaging interventions, and increasing dynamics of the campaign were planned based on trial accounts promotions with the main goal of increasing user engagement in the campaign. While negative results were observed with earlier campaigns that were performed with the use of incentives, typical techniques were not used to increase campaign dynamics [15].

The viral marketing campaign was analyzed over an 11-week period (78 days). A total of 73,374 unique users logged into the virtual world during this period. Of these, 6481 (8.8%) were invested users, 1775 (2.4%) were engaged users, and 65,118 (88.7%) were casual users. Information about how to access the premium content was initially seeded among 110 users, of whom 44 were invested users, seven were engaged users, and 59 were casual users. Users with the highest degree among users logged into the system were selected as seeds. As depicted in Figure 2, a spike of campaign activity occurred during the first week after seeding, with 260 infections and 105 purchases being recorded during this period. In Week 2, however, interest in the premium content had declined, with infections dropping to 68 and only 24 purchases being recorded. Anecdotal feedback suggested that users who had purchased the premium content were reluctant to spread information about how to access the content to all but their closest friends, thus effectively thwarting the viral transmission of this information. This behavior was entirely consistent with the attempt to preserve a product whose value was derived, in part, from its relative rarity. Moreover, because of the relatively small number of users who had purchased the content in the first three weeks of the campaign (i.e., 156 users; see Figure 2), the opportunities for other users to observe those who had activated the premium content was also limited.

Two interventions were therefore conducted to stimulate viral activity surrounding the flow of information. In Intervention 1, a one-off event drawing together users who had purchased the premium content was scheduled for the 25th day (i.e., Week 4) after seeding. The motivation for initiating the event and grouping users who had purchased the premium content was to increase the likelihood that those unfamiliar with the content would become aware of it. The timeline for the event was as follows; on the 23rd day, users who had purchased the premium content were alerted that a themed area relating to the premium content would become available at a specific time within two days. Two days later, users who had purchased the premium content came to inspect the new area, as did those who had not purchased the content. Thus, in line with epidemiological principles, a group of infected and non-infected users were encouraged to congregate in the same area, in order to encourage the diffusion of the infection. However, as demonstrated in Figure 2, Intervention 1 had a limited impact on viral activity beyond a one-day spike in infections. Intervention 2 utilized a different approach. Specifically, a supporting viral campaign was initiated during Week 8 in which users could experience a free, one week trial of the premium content. Once again, a small number of seeds were given the location and password to access this content, and users were free to disseminate this information to other users. Although the password expired at the start of Week 10, users continued to transmit the password throughout Weeks 10 and 11.

The Intervention 2, which was tracked separately to that of the primary campaign, infected 1614 users between Week 8 and Week 11. Chi-square tests of independence revealed that invested and engaged users were more likely to transmit and be infected by the campaign than casual users (see Table 1). However, no group-based differences were observed in the percentage of those infected that went on to purchase the premium version of the content following the conclusion of the trial content. The Intervention 2 also appeared to influence the premium content campaign. In other words, infections for the premium content campaign increased in Weeks 10 and 11, following the cessation of the trial campaign (see Figure 2).

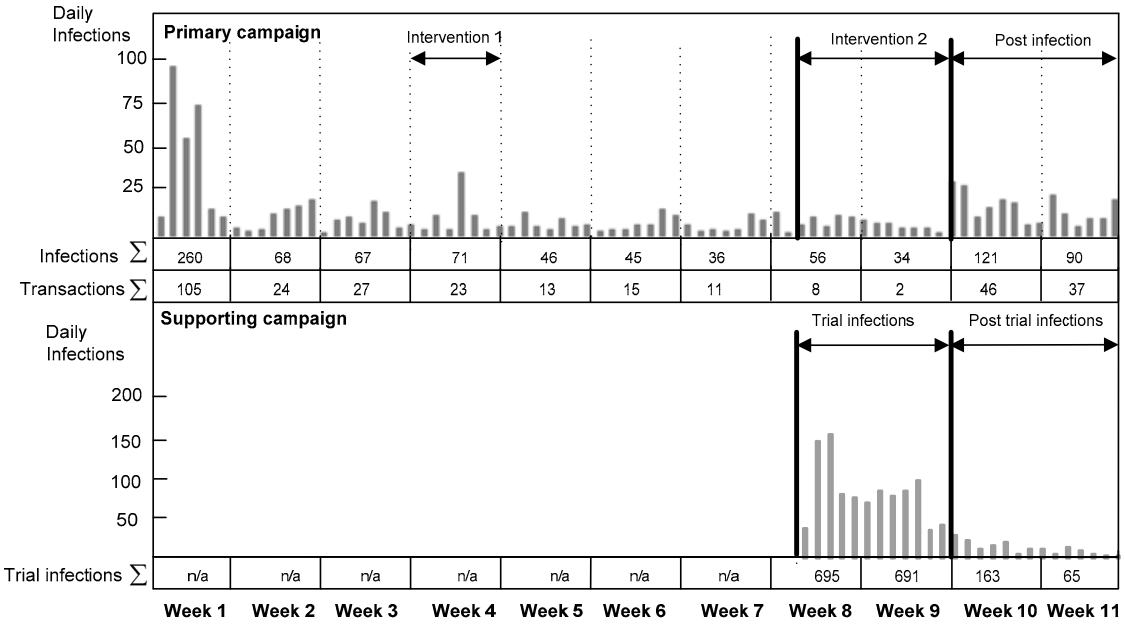

Figure 2. Number of infections and transactions associated with the viral campaign over time.

Table 1. Impact of the Intervention 2 viral campaign.

	Invested Users		Engaged Users		Casual Users		χ^2
	n	%	*n*	%	*n*	%	
Transmission status							1315.12 ***
Transmitter	266	**4.1**	113	**6.4**	343	0.5	
Non-transmitter	6215	95.9	1662	93.6	64,775	**99.5**	
Infection status							2329.44 ***
Infected †	552	**8.5**	222	**12.5**	840	1.3	
Not infected	5929	91.5	1553	87.5	64,278	**98.7**	
Purchasing status ‡							3.6
Purchaser	21	3.8	9	4.1	19	2.3	
Non-purchaser	531	96.2	213	95.9	821	97.7	

*** $p < 0.001$. † Includes those cases which received the campaign via seeding. ‡ Only those cases who had received the campaign could make a decision about whether to purchase the premium content. This analysis therefore only examines those who had received the campaign. Underlined percentages indicate adjusted standardized residual ≤ -1.96; **Bolded** percentages indicate adjusted standardized residual ≥ 1.96.

When the campaign for the premium content was examined in its entirety, a considerable viral activity was revealed. From the 110 users who were originally seeded with the campaign, 894 users were ultimately infected, resulting in 347 transmissions and 311 purchases. There were, however, substantive group differences in viral activity. Specifically, invested and engaged users were more

likely to have transmitted and been infected by the campaign than their casual user counterparts (see Table 2). Invested users were also more likely to have purchased the premium content than engaged and casual users.

Differences were also observed in group infection rates among those who ultimately purchased the premium content. Perhaps unsurprisingly, invested users who purchased the premium content were most likely to have been infected by other invested users (see Table 3). However, a somewhat different pattern emerged among those that were engaged and casual users who ultimately purchased the premium content. While invested users continued to represent the major source of infections among these groups, casual users were significantly more likely to infect engaged and casual users than they were to infect invested users. As such, the source of the infection exerted an influence as to whether users ultimately purchased the premium content.

Table 2. Impact of the total viral campaign.

	Invested Users		**Engaged Users**		**Casual Users**		χ^2
	n	**%**	***n***	**%**	***n***	**%**	
Transmission status							1211.82 ***
Transmitter	208	**3.1**	35	**2**	104	0.2	
Non-transmitter	6481	96.9	1740	98	65,014	**99.8**	
Infection status							2631.03 ***
Infected †	464	**7.2**	118	**6.6**	312	0.5	
Not infected	6017	92.8	1657	93.4	64,806	**99.5**	
Purchasing status ‡							41.06 ***
Purchaser	207	**44.6**	28	23.7	76	24.4	
Non-purchaser	257	55.4	90	**76.3**	236	**75.6**	

*** $p < 0.001$. † Includes those cases which received the campaign via seeding. ‡ Only those cases who had received the campaign could make a decision about whether to purchase the premium content. This analysis therefore only examines those who had received the campaign. Underlined percentages indicate adjusted standardized residual ≤ -1.96; **Bolded** percentages indicate adjusted standardized residual ≥ 1.96.

Table 3. Source of infection among users who ultimately purchased the premium content.

	Invested Users		**Engaged Users**		**Casual Users**		χ^2
	n	**%**	***n***	**%**	***n***	**%**	
Infection source							13.35 *
Invested users	167	**80.7**	16	57.1	49	64.5	
Engaged users	10	4.8	2	7.1	5	6.6	
Casual users	30	14.5	10	**35.7**	22	**28.9**	

* $p < 0.05$; Underlined percentages indicate adjusted standardised residual ≤ -1.96; **Bolded** percentages indicate adjusted standardised residual ≥ 1.96.

4. Discussion

Experiments were performed, to examine the effectiveness of a supporting viral campaign with the use of interventions based on user engagement. A proposed approach showed a sustainable solution for increasing user interest in the campaign, without having a negative influence on the user experience. The purpose of the campaign was to promote new premium content that allowed the users of a virtual world to further customise the appearance of their avatar. Research in a non-virtual world context suggests that scarce products are perceived as being more desirable than widely available ones [32,33], and such perceptual patterns are only likely to be enhanced in virtual world contexts because of the value that users place on customising the appearance of their avatar [34]. Despite this potential barrier to dissemination, viral activity surrounding the access to premium content was nevertheless identified. This case study, therefore, supports the notion that viral marketing effects

can be observed in virtual worlds, even in situations where many users may be reluctant to spread the viral content. Interestingly, many users appeared reluctant to distribute information about how to access this premium content, potentially reducing the viral scope of the campaign. From a user perspective, this reluctance was arguably a rational exercise in maintaining the value of the avatar customisations that are on offer.

From a viral marketing perspective, the current findings suggest that viral activity will differ as a function of users' investment and engagement with the virtual world. In particular, those who had either made monetary investments in, or were regular users of, the virtual world were more likely to have been infected by the viral content and to have subsequently transmitted this content to other users. From a viral marketing perspective, those who are invested or engaged in the virtual world may, therefore, represent ideal candidates for the initial seeding of the viral content. This approach is consistent with recent research on enhancing the dissemination of viral content, which has focused particularly on identifying optimal methods of campaign seeding. Hinz et al. [14], for instance, found that seeding viral content among individuals with many social connections was particularly effective in maximising the eventual reach of that content. While van der Lans et al. [10] developed a model to examine, in part, the effect that different seeding strategies would have on the viral dissemination of content. This focus on campaign seeding is perhaps a reflection of the difficulties associated with developing or managing other elements of viral marketing campaigns. Indeed, developing content that connects emotionally with target audiences is one of the chief factors that is associated with a campaign's viral success [35], and it is dependent on finding and executing one-off, non-replicable creative ideas. Similarly, short of providing incentives to encourage users to disseminate viral content to members of their social network [36], enhancing the spread of viral content between individuals typically falls outside the control of campaign managers. As a firm-initiated process, seeding, therefore, represents one of the few mechanisms available to campaign managers for controlling the diffusion and the eventual reach of viral content. Directing seeding activities towards invested or engaged users may, therefore, represent a potentially efficacious strategy for enhancing the viral dissemination of campaign content.

The current findings also suggest that invested and engaged users may represent the primary target audience for viral campaigns. This is not only proven by their greater likelihood of being infected by the viral content, but also by their propensity to take part in campaign diffusion. Nevertheless, as far as the two groups are concerned, those who are invested users are perhaps more likely to respond to monetary-based calls to action that is embedded within the viral campaign. After all, one of the best predictors of future behavior is past behavior [4,37], and invested users have already demonstrated an inclination to purchase virtual content by virtue of their previous purchase patterns. This was certainly evident in the current study. Invested users were more likely to purchase the premium content that formed the basis of the viral marketing campaign, than engaged and casual users. Therefore, selectively targeting invested users as the primary audience of the campaign increases the likelihood that desired consumer behaviour underpinning the viral campaign (i.e., purchasing the premium content) will be enacted.

On the basis of these findings, some users may appear to be more valuable than others by virtue of their greater propensity to be involved in viral marketing campaigns (invested and engaged users) or their increased likelihood of purchasing virtual content (invested users). However, seemingly less valuable users may also exert an important influence on the behavior of others. Casual users, for example, were over-represented as the infection source for engaged and casual users who ultimately went on to purchase the premium content. These findings may be indicative of homophily effects [38], since invested users may be more likely to affiliate with other invested users, thus reducing their opportunities for interacting with engaged and casual users. Alternatively, information exchanges that are initiated by casual users may be more impactful by virtue of the fact that their reduced investment in the virtual world increases the objectivity of their comments. Irrespective of the cause, these findings demonstrate the unexpected value that seemingly unimportant user groups may provide in terms of

encouraging users towards action. Such insights provide another example of the benefits of using virtual worlds to explore viral marketing effects. After all, in the majority other contexts, it is difficult to measure not only whether an individual was exposed to the viral campaign, but also who referred them to the campaign, and whether they ultimately went on to enact any behavior as a result of the campaign.

The current findings also suggest that virtual worlds can be used to experimentally evaluate the effectiveness of different viral marketing strategies. Two specific strategies were assessed in this case study. The first strategy was centered on encouraging infected and non-infected users to congregate in the same location in an effort to stimulate dissemination of the viral content. In favor of this strategy was the fact that the activated premium content (i.e., reduced avatar size relative to other avatars) was immediately apparent to all users, providing observers with a cue for requesting information about how to access the content. At the same time, however, many users appeared to be reluctant to disseminate information about how to access the premium content. Moreover, the event was restricted to a single area in the virtual world at a single point in time, thus reducing the number of users that would be likely to encounter the event. For these reasons, the first strategy had limited long-term effects on infection or purchase.

A second strategy, which centered on using viral processes to disseminate a trial version of the premium content, was also assessed. Unlike the previous strategy, this resulted in considerable viral activity. Indeed, more than 1600 users were infected with the trial version of the premium content, compared to the 900 users (or so) who were infected with the campaign for the premium content. The differential rates of infection that are associated with these two campaigns may have arisen as a result of differences in the product offered. For instance, the trial content was free for a limited period, and may, therefore, have had greater viral potential than the premium content, which had to be purchased before it could be activated. However, the results also suggest that the trial campaign may have suppressed actual purchases. Specifically, 3.8%, 4.1%, and 2.3% of invested, engaged, and casual users, who, respectively, participated in the campaign for the trial content, went on to purchase the premium content. In contrast, 44.6% of invested users, 23.7% of engaged users, and 24.4% of casual users who took part in the campaign for the premium content went on to purchase that content. Thus, as far as virtual products with limited intrinsic value are concerned, providing a free trial of a premium product may increase infection rates at the expense of actual purchases, without causing a negative influence on the user experience. Campaign managers should, therefore, ensure that the strategies that are instituted to increase viral activity do not cannibalize actual product sales.

The presented study delivered theoretical and practical contributions to the field by showing how information spreading processes can be supported without the use of typical techniques, like incentives, which usually increase the number of messages and perceived information overload. From a theoretical point of view, supporting campaigns open new areas apart from the more commonly analyzed competing campaigns. Information spreading processes were analyzed earlier, mainly from the perspective of modeling techniques, seed selection, processes dynamics, or final coverage. The majority of earlier studies that are related to information spreading processes are based on theoretical models, and are, in fact, difficult to use in real campaign analytical models. The current study delivers insights from real viral campaigns with detailed quantitative data and creates a background for new viral marketing strategies.

5. Conclusions

As several Authors have noted, many real-life companies are beginning to have a corporate presence in virtual worlds as a means for interacting with both present and potential consumers [39–41]. At the same time, consumer markets for virtual and real-life products are also emerging. Indeed, as the current case study suggests, users of virtual worlds are often willing to purchase virtual products as a means for further differentiating their avatars from those of others. Virtual worlds are therefore becoming places that are meant not only for social interaction, but also for commerce. Within this

context, the current findings provide important insights about how companies can maximally leverage viral marketing processes to promote their products or services in virtual worlds.

Like all studies, ours is not without limitations. The most obvious limitation is that the research findings were generated using a campaign that had taken place in a single virtual world, thus potentially limiting the generalization of the study findings. Nevertheless, using a 'live' virtual world had the advantage of allowing us to examine real interactions between users, as opposed to the potentially artificial interactions that often take place in many laboratory-based studies.

This research demonstrates the considerable potential that virtual worlds offer for practitioners and scholars that are interested in understanding the mechanisms that underpin viral marketing. As noted earlier, efforts to effectively measure and model viral marketing processes have been hampered by data availability issues. Thus, to date, analytical approaches for examining viral marketing mechanisms have typically employed pure simulation techniques [42], used simulation techniques when examining actual campaigns to estimate those data points for which no data was available [10,36], conducted self-report studies of intentions [7], or examined contexts that approximate viral marketing [43]. Each of these approaches is characterized by various restrictions that limit the accuracy or generalization of the study findings. Virtual worlds, in contrast, have the potential for measuring each aspect of a viral marketing campaign. At the same time, virtual worlds provide the benefits of a laboratory-like environment in an empirical context that closely resembles reality.

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