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Research Paper

Virtual reality: a journey into the heart of brands

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ABSTRACT
This paper examines the assumption that the use of virtual reality is able to positively affect customer loyalty by optimizing immersion. To this end, a conceptual model integrating the effect of presence in virtual reality facets on consumer loyalty has been developed. Specifically, through a questionnaire-based survey of 300 Internet users, we found that virtual reality experience significantly increases online consumer loyalty.
***KEYWORDS**: Immersion, virtual reality, online loyalty, costumer-experience.*

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I. INTRODUCTION

Digitization of customer experience progress in information and communication technology seems to be changing consumer behaviour. This latter is increasingly moving towards e-commerce (Loupiac, 2007). Indeed, while allowing entertainment and information exchange, the Internet has become the main communication channel between the company and its customers. However, in spite of the lightning evolution of e-commerce, some problems incumbent to the relationship between companies and customers are still possible. Indeed, many companies have difficulty maintaining a stable and lasting relationship with consumers who have become more demanding, knowledgeable and volatile. The latter are no longer looking to ensure simple transactions, but rather to be connected to their brands when they immerse in a virtual environment in order to live unique and enjoyable shopping experiences. In this regard, in order to adapt to the evolution of consumer behavior and lifestyle, companies are more and more looking for techniques allowing the optimization of customer experience (Berry, 1983). From this perspective, the staging of a rewarding online experience can give companies a competitive advantage (Gilmore and Pine, 2002). Indeed, customers who visit retailer sites still want to test products beforehand and are looking for experiences similar to those in stores. In response to these findings, new 'virtual reality' technologies offer applications that provide a more user-friendly online shopping experience by combining the advantages of both brick-and-mortar and online stores (Straaten and Schuemie, 2000). Thus, in addition to a virtual shopping experience, users benefit from a better detailed 360-degree visualization of products. Moreover, virtual reality often bears on the feeling of 'presence' created by the machine, which allows the customer to feel truly present in the sales space (bouvier, 2009). Then, it seems that companies that succeed in triggering this feeling of presence in a web context, are those that are the most successful in their marketing strategies and those that ensure the most favorable customer behavior. In this vein, ensuring a feeling of 'presence' in the consumer's mind is more likely to improve the relationship with the customer (Bai et al, 2006). Under this very perspective, loyalty seems to be a must for the success of this relationship. This is why it is becoming an ongoing concern for companies operating online. However, this online loyalty seems to be exclusive in a web context, to online shopping and to cyber-consumers. It can be triggered by a favorable evaluation of the browsing context, which is in turn favored by the feeling of presence in virtual reality. However, the contributions of virtual reality seem to be, until now, very little studied by business practitioners despite its relevance. This state of affairs aroused our curiosity and led us to wonder about the impact of the 'virtual presence' of a user on their online loyalty. Then, this study tries to answer the following question: ***What is the impact of the virtual reality presence on online customer loyalty?***

THEORETICAL BACKGROUND

If one of the challenges for online companies is to optimize customer experience, this means that this experience should be made memorable (Pine and Gilmore, 1999) and real (Gilmore and Pine, 2002). In what follows, we review the literature on virtual reality in an online shopping experience.

Virtual reality in an online shopping context

Virtual reality is "*a set of computer applications and behavioral interfaces whose purpose is to simulate in a virtual world, the behavior of one or more users interacting in real time*" (Fuchs et al, 2003). This technology allows the programmable manipulation of information for the user to be able to extrapolate a real situation into a real experience in a virtual dimension (Vial, 2013). In this regard, the virtual allows for an artificial representation or a simulation of the real thanks to the algorithmic language coding the interface between man and machine. This is how individuals manage to access the virtual space in which they can interact with the product in a way as natural and real as possible. More specifically, the virtual reality device allows customers who want to immerse themselves in a virtual store, a representative program of the store, while actually translating the shopping trip in a virtual way (Fusch, 2003). However, the success of the immersion depends not only on the device used but also on the user's ability to appropriate the technical device in unconscious way (Fusch et al., 2003). Then, this simulation should be realistic enough to give the user a better feeling of immersion. In this line of thought, Fusch (2006) constructs a relevant three-level immersion model, namely, a sensory-motor interfaces level, a cognitive interaction level and a functional interaction level. In this model, the first level allows the user to interact physically with the virtual world through the operation of Sensory Interfaces (SI) and Motor Interfaces (MI) and Sensory-Motor Software Aids (SM-SA). As for the cognitive immersion and interaction process, it bears on the mental cognitive activities of the user who can call upon certain automatisms that they have assimilated in the real world by implementing them in a virtual context. As for the functional interaction level, it aims at decomposing the user's activities into some primitive behaviors or 'Virtual Primitive Behaviors' (VPBs) such as observation of the virtual world, physical action and communication with others or with the application.

The feeling of 'presence' in virtual reality

Immersion in virtual reality can sometimes seem so real to the user that they feel like they are part of or present in the company's web environment. Under this perspective, the concept of 'presence' denotes 'the psychological perception of being there, inside the virtual environment and in which one is immersed' (Straaten and Schuemie, 2000). It is a subjective perception and interpretation of sensory impressions (Ellis, 1991) by the user who abandons the real world to enter a new virtual world. On the other hand, intensity of the immersion experience depends on the degree of realism of the entities that make up this experience. Therefore, the user who accepts to go into a company's virtual environment and judges it as credible is able to develop a sense of presence (Bouvier, 2009). Moreover, Lombard (2000) believes that 'even if the experience is generated by technology, some or all of the individual's perceptions fail to recognize the role of technology in the experience'. In a similar vein, Heeter (1992) identifies three dimensions of the sense of 'presence': personal presence or the feeling of being present in the virtual environment (being there); environmental presence as the reactions of the virtual environment to the user's presence and responses; and social presence as the awareness of and interaction with other elements in the virtual space (living or not). Therefore, it seems that the sensation of presence in a virtual reality allows the user to plunge into the heart of brands, which is likely to affect their online loyalty.

Online customer loyalty

A review of the literature on consumer loyalty in the broadest sense reveals the presence of four approaches that assessed the concept: the behaviorist approach (Franck, 1967; McConnel, 1968), the cognitive approach (Labarbera and Marzusky, 1983), the composite approach (Dick and Basu, 1994) and the processual approach (Oliver, 1997). Definitions of online consumer loyalty draw heavily on Oliver's (1997) processual approach, which refers to 'a deep commitment to purchase a preferred product or service in the future...despite the influences and marketing efforts that may cause switching behaviour'. This definition suggests a sequential or processual approach to loyalty starting at the cognitive level, moving through the affective level to the conative level of loyalty. According to the author, the cognitive, affective and conative (intentional) phases form the attitudinal dimension of the customer. These should be supplemented by a dimension that represents the action itself (Oliver, 1997). Moreover, knowing that intention cannot systematically generate similar behaviour, repeated behaviors may not reflect consumers' intentions (Hennig-Thurau and Hansen, 2000). In this regard, Toufaily (2011) sums up online loyalty in 'maintaining a stable relationship, based on a favorable rational evaluation of the online business, accompanied by an emotional attachment and a willingness to continue the relationship that manifests itself through repeated visits and/or purchases, despite unfavorable circumstances and marketing efforts that lead to a switching behavior'.

Virtual reality 'presence' as a trigger of online customer loyalty

If the fact of feeling transported from a real to a virtual environment depends on the user's perception and intensity of the ‘presence’ sensation of that they experience, it seems that this sensation is likely to amplify their satisfaction levels with the site and lead them to revisit it (Loupiac, 2007). Indeed, such a positive behavior surfaces when a virtual store is loaded with emotions that can immerse the user in the online environment (Lee, 2004). The elements that make up this environment are thus apprehended as real objects that promote the feeling

of being 'there', transporting the user into the brand's universe and fostering their attachment to it (Stuer, 1992). Then, we can assume that presence in virtual reality positively impacts the loyalty of users who immerse themselves into the brand's site. Accordingly, we formulate the following hypothesis: *Virtual reality 'presence' increases the online customer loyalty.* Being multidimensional, it is advisable to appreciate the different dimensions of loyalty. However, given the aim of this study, only the two dimensions of 'environmental presence' and 'social presence' will be considered. Indeed, some studies postulate that the perception of the virtual environment is not made through its appearance (properties of size, shape, color, etc.) but through the possibilities offered to the consumer to act in this environment (Gibson, 1986). Therefore, presence is the sum of actions and answers which are carried out in the virtual environment (Zahorik and Jenison, 1998). The result is that the individual probably cannot develop a feeling of being there (in an environment) without this perception being translated into actions in this environment. Bearing on these assumptions, we consider only the two dimensions of environmental and social presence. Moreover, it should be noted that the virtual immersion process provides a very large volume of information on the dimensions of the digital environment (Charfi, 2006). Then, the more the presence in this environment is perceived as credible, the more it facilitates the search for information that improves access to the brands (Lynch and Ariely, 2000). This is not likely to have an effect on customer retention and return to the site. Moreover, the commercial elements of the virtual environment determine the level of immersion of Internet users and promote direct interaction with the products and services (Charfi, 2006). This naturally increases the Internet user's degree of involvement and their intention to recontact the brand and to behave positively towards it. Following this line of thinking, we formulate the following hypotheses:

H1: 'environmental presence' in virtual reality increases the online customer loyalty.
H1.1: 'environmental presence' in virtual reality increases the emotional customer loyalty.
H1.2: 'environmental presence' in virtual reality increases the cognitive customer loyalty.
H1.3: 'environmental presence' in virtual reality increases the online conative customer loyalty.
H1.4: 'environmental presence' in virtual reality increases the online behavioral customer loyalty.

As for social presence, Diesbah et al (2006) believe that the presence of relevant virtual elements in stores gives the user a sense of social belonging. Customer interaction with virtual elements may well be a solution for users seeking emotional and entertainment relationships in their online shopping experience. Therefore, awareness of and interaction with the elements of the virtual space probably leads to a better retention of the Internet user (Toufaily, 2011). The latter is probably more likely to return to the site or recommend it to other Internet users. In this line of thought, previous studies agree on the fact that sites that include a virtual agent are more engaging, more attractive and more fun than those that do not (Holzwarth et al., 2006, Charfi, 2006). These virtual agents generate more positive effects and positive behaviors (Wang et al, 2007) since they help guide users during browsing and promote more interaction (Notebaert, 2016). With these assumptions, there seems to be a better perceived value for the site (Charfi, 2006), promoting loyalty to it (Notebaert, 2016). Accordingly, we formulate the following hypothesis:

H2: 'social presence' in a virtual reality increases the online customer loyalty.
H2.1: 'social presence' in a virtual reality increases the emotional customer loyalty.
H2.2: 'social presence' in a virtual reality increases the cognitive customer loyalty.
H2.3: 'social presence' in a virtual reality increases the online conative customer loyalty.
H2.4: 'social presence' in a virtual reality increases the online behavioral customer loyalty.

These hypothetical relationships are developed into the following model:

Virtual reality presence

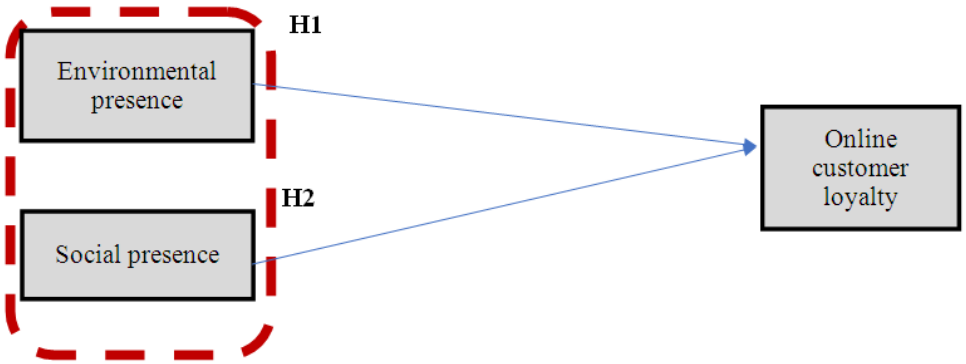

Figure N°1: Simplified research model

II. RESEARCH METHODOLOGY

Our focus is the e-commerce sector, a booming sector that perfectly meets the objectives of our study. More specifically, a virtual reality device showcasing a 3-dimension virtual visit of an online store ("Gascogne's Ducs") was used. This device offers Net surfers the possibility to browse the online store and to interact with the components of the virtual store. However, in order to prepare respondents, we integrated a video describing the virtual visit experience. Then, an 'avatar' nicknamed 'Victoria' represents the customer and another avatar plays the role of the virtual agent. The sampling process proceeded by identifying the target population, which includes anyone who makes online purchases and has tried virtual reality technology at least once. The convenience sampling method is adopted to maximize response rates. Finally, a convenience sample of 300 French respondents was selected. The data collection method consisted in conducting a questionnaire-based survey using 5-point Likert-type scales. Once designed, the questionnaire was piloted for adjustments. The final questionnaire was administered via Facebook in order to guarantee better response rates and increase the number of respondents. The operationalization of the concepts proceeded as follows: for the 'presence' independent variable, we chose the scale developed and validated by Bouvier (2009) because of its psychometric qualities and its adaptation to the context of the study. In particular, we retained the dimensions of 'environmental presence' and 'social presence' as independent variables representing 'presence'. for the dependent variable 'online loyalty', its measurement remains ambiguous as it is a multidimensional concept. Accordingly, we used Oliver's approach (1997, 1999) to adapt the measurement of loyalty to an e-commerce context while taking into consideration the technological dimension and the specificities of the virtual environment. Indeed, the measurement of online loyalty in a relational perspective leads us to consider, first of all, the dynamic aspect of this concept. Therefore, we adapted the online loyalty scale following Toufaily (2011). The data analysis method proceeded into two phases: a first exploratory phase whose objective is to purify the scales used to measure the different concepts, while checking for their reliability; a second confirmatory phase which consists of validating the research hypotheses and testing the conceptual model using the one-factor analysis of variance (ANOVA) method. The latter is applied whenever the simultaneous effects of several independent variables on several dependent variables should be taken into consideration. This method allows for testing whether the differences in variance in each group defined by the modalities of the independent variables deviate significantly from the value 0, and this simultaneously across all the independent variables. The larger the difference between the group means observed in the sample, the more likely it is that there is a relationship in the population. In other words, the smaller the dispersion across groups, the more real the difference between the means in the population.

The general model is written as follows:

$$y_{ijk\dots} = \mu + f(i,j,k\dots) + \boldsymbol{\varepsilon}$$

With $y_{ijk\dots}$ the dependent variable, μ is a constant, $f(i,j,k\dots)$ denotes the relationship between the independent variables and $\boldsymbol{\varepsilon}$ is the measurement error.

The fundamental assumption is that the error follows a normal distribution: $\boldsymbol{\varepsilon} = \boldsymbol{N}(\mathbf{0}, \boldsymbol{\sigma^2})$. The null hypothesis in this test assumes that the means are equal.

III. DISCUSSION OF RESULTS

Before reporting the results, it is necessary to present the reliability and validity estimates of the measurement scales. For the 'environmental presence' scale, the results of two successive PCAs retained only one-item factor that explains 68.466% of total variance. Moreover, the elimination of misrepresented items led to an improvement in Cronbach's Alpha coefficient to reach 0.967. The results of the PCAs are presented in the following table:

Table 1: Factor analysis and reliability of 'environmental presence' scale

Items	Communalities	Factor loadings F l (68,466%)	Reliability α of construct if item deleted
présence3	,677	,823	,964
présence5	,737	,858	,964
présence6	,574	,757	,965
présence10	,762	,873	,963
présence12	,826	,909	,963
présence13	,762	,873	,963
présence14	,790	,889	,963
KMO = 0 ,960		**Alpha = 0,967**	

Table 2: Factor analysis and reliability of 'social presence' scale

Items	Communalities	Factor loadings F (72, 16%)	Reliability α of construct if item deleted
présence3	0,869	0,932	0,892
présence5	0,844	0,919	0,913
présence6	0,898	0,947	0,868
KMO = 0 ,753			**Alpha = 0,925**

Conducting a PCA on the 'online loyalty' scale resulted in two factors: the first one consists of 8 items and the second one consists of 3 items. The PCA generated a two-dimensional structure for the online loyalty construct. The two dimensions represent affective and conative loyalty. The two scales have a good internal coherence, as their Cronbach's Alphas are respectively 0.975 and 0.847. The results of the PCA conducted on online loyalty are reported in Table 3 below:

Table 3: Factor analysis and reliability of online loyalty scale

Items	Communalities	Factor loadings	
		F l (69,837%)	**F 2 (13,868%)**
Fidèligne1	,859	,924	
Fidèligne2	,858	,919	
Fidèligne3	,709		,537
Fidèligne4	,854	,911	
Fidèligne5	,807		,731
Fidèligne6	,815		,705
Fidèligne7	,884	,928	
Fidèligne8	,871	,907	
Fidèligne9	,880	,924	
Fidèligne10	,773	,862	
Fidèligne11	,896	,928	
KMO = 0.932	**Alpha = 0,975**	**Alpha = 0,847**	

Once our scales have been purified, we proceed to validate our hypotheses and test our model. More specifically, ANOVA was applied to our model in order to test the effect of 'virtual reality presence' through its two facets of social and environmental presence on the dimensions of 'online loyalty (Appendix 2). The results are reported in Table 4 below:

Table 4: One-factor ANOVA

Hypotheses	Significance	Result
Environmental presence-----Affective loyalty	$p \leq 0,05$	Retained
Environmental presence-----Conative loyalty	$p \leq 0,05$	Rejected
Social presence ------Affective loyalty	$p \leq 0,05$	Retained
Social presence------Conative loyalty	$p \leq 0,05$	Retained

These results indicate that online loyalty is partly determined by the user's presence in virtual reality. The most significant impact comes from the social dimension of presence, which simultaneously and significantly affects both the affective and conative dimensions of online loyalty. This finding is consistent with that of Bouvier (2009). Moreover, the integration of a virtual agent in a website contributes to establishing social ties with the user, making the immersion experience more pleasant and interactive. The integration of a virtual agent is able to increase the value of the site in the eyes of its users, thus inciting users to engage in more positive behaviors towards the site. Specifically, the integration of a virtual agent will induce a positive impact on the intention of the Internet user to visit the site and recommend it to other Internet users (Quang-Trié, 2013). The agent's role is to assist users in their browsing experience by advising, guiding and encouraging the customer to stay on the site and to recommend it to other Internet users. Similarly, we integrated a virtual agent as a virtual advisor. Therefore, the feeling of presence in virtual reality is able to increase online loyalty in its affective facet (Lee, 2004). Such an experience will be more appreciated by the customer compared to a simple visit to the retailer's website, since it gives the impression that the customer is actively participating in the online shopping experience and will probably encourage them to return to the site and thus increase their loyalty.

IV. CONCLUSION

Digital tools have transformed the means available to the company to build customer experience and reproduced information sources through different points of contact. Such a digitization of experience calls for the customer to be more accurate, more adapted and more flexible. In this regard, the obtained results seem to

highlight the role of virtual reality presence in building online customer loyalty. More innovative and sophisticated virtual reality presence promises to deliver a better online customer experience at the most appropriate time. This finding probably allows us to propose a set of recommendations for managers to win this challenge. They should develop the means able to make them better know customers (Perrin and Ricard, 1995) in order to satisfy them and maintain a solid and a lasting relationship with them (Grönroos, 1994, 1997). Particularly, managers should monitor e-commerce sites in order to detect the opportunities that help them produce extraordinary experiences while lessening the "dehumanization" of the man-machine relationship. Then, 360° virtual tours of showrooms are highly recommended in order to take the customer into a three-dimensional virtual shopping experience. Such experiences are able to attract and renew their interest in reliving other online shopping experiences. In addition, the integration of an AI-equipped virtual agent is an essential lever for optimizing customer relationship management over the long term. Developing certain devices in this way will enable managers to anticipate customer expectations by analyzing their browsing history. This can promote customer experience on the site.

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Appendices

Appendix 1 : One-Factor ANOVA

		Sum of Squares	df	Mean of Squares	F	Significance
real visit	within-groups	26,786	1	26,786	25,732	,000
	between-groups	306,048	294	1,041		
	Total	332,834	295			
feeling of being in control of the site navigation	within-groups	17,438	1	17,438	15,416	,000
	between-groups	331,423	293	1,131		
	Total	348,861	294			
similar experience	within-groups	13,025	1	13,025	10,289	,001
	between-groups	372,188	294	1,266		
	Total	385,213	295			
feeling of being present	within-groups	21,802	1	21,802	18,137	,000
	between-groups	353,411	294	1,202		
	Total	375,213	295			
reality of the virtual world	within-groups	12,754	1	12,754	10,360	,001
	between-groups	360,724	293	1,231		
	Total	373,478	294			
feeling of controlling a pointer	within-groups	19,849	1	19,849	16,332	,000
	between-groups	356,083	293	1,215		
	Total	375,932	294			
real world awareness	within-groups	10,232	1	10,232	8,576	,004
	between-groups	350,781	294	1,193		
	Total	361,014	295			
credibility of the visit	within-groups	15,537	1	15,537	12,434	,000
	between-groups	367,368	294	1,250		
	Total	382,905	295			
interaction with the virtual environment	within-groups	6,648	1	6,648	1,489	,223
	between-groups	1299,366	291	4,465		
	Total	1306,014	292			
virtual reality visit	within-groups	24,703	1	24,703	17,587	,000
	between-groups	412,959	294	1,405		
	Total	437,662	295			
feeling of being in a shop	within-groups	14,845	1	14,845	9,673	,002
	between-groups	452,718	295	1,535		
	Total	467,562	296			
Emotions	within-groups	11,412	1	11,412	7,583	,006
	between-groups	440,974	293	1,505		
	Total	452,386	294			
surrounded by human beings	within-groups	22,442	1	22,442	13,212	,000
	between-groups	501,100	295	1,699		
	Total	523,542	296			
robot awareness	within-groups	31,586	1	31,586	19,782	,000
	between-groups	472,619	296	1,597		
	Total	504,205	297			
	within-groups	836,149	296	2,825		
	between-groups					
	Total	877,789	297			
interaction with real people	within-groups	31,188	1	31,188	16,775	,000
	between-groups	548,449	295	1,859		
	Total	579,636	296			
Preference of a virtual reality site	within-groups	23,207	1	23,207	16,283	,000
	between-groups	419,009	294	1,425		
	Total	442,216	295			
the best offers are from a virtual reality site	within-groups	15,965	1	15,965	12,191	,001
	between-groups	382,389	292	1,310		
	Total	398,354	293			
preference for virtual reality site services	within-groups	16,264	1	16,264	6,535	,011
	between-groups	729,261	293	2,489		
	Total	745,525	294			
like the characteristics of a virtual reality site's offer	within-groups	23,843	1	23,843	18,174	,000
	between-groups	383,096	292	1,312		
	Total	406,939	293			

like the performance and services of a virtual reality site	within-groups	23,630	1	23,630	14,295	,000
	between-groups	484,356	293	1,653		
	Total	507,986	294			
preference to use virtual reality sites	within-groups	30,144	1	30,144	18,481	,000
	between-groups	476,281	292	1,631		
	Total	506,425	293			
choice of the characteristics of a virtual reality site	within-groups	17,459	1	17,459	11,023	,001
	between-groups	435,552	275	1,584		
	Total	453,011	276			
promote the offers of a virtual reality site	within-groups	33,152	1	33,152	18,746	,000
	between-groups	518,157	293	1,768		