

Effects of perceived interactivity on commercial web sites' experiential value

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ABSTRACT: Little is known about perceived interactivity's effects on commercial web sites' experiential value. The present investigation considers this ambiguous relationship. S-O-R model and flow theory illuminate many facets of it. A quantitative research within 385 subjects consolidate the theoretical dissertation. Results demonstrate that perceived interactivity composed of reciprocity; receptivity, perceived speed and non verbal information play a considerable role in predicting cognitive and affective web user's responses. Accordingly, some managerial implications are proposed. Companies have to improve the interactive qualities of their commercial web sites in order to favor utilitarian and hedonic gratifications. Ensuring more control, convenience, less effort and a high level of efficiency seems to be a priority. They should also put consumers at the heart of managerial decisions to build effective e-marketing strategy and achieve profitability goals.

KEYWORDS: Perceived interactivity, reflective measurement model/ Formative measurement model, Telepresence, Control, validating formative constructs, web site experiential value.

1 INTRODUCTION

In 1995, [1] discuss for the first time the concept of perceived interactivity. Since, perceived interactivity has been conceptualized and operationalized in different ways [2]. Most researchers recognize the complex and multidimensional nature of perceived interactivity. The consensus is far from being general about what the perceived interactivity exactly represents.

Some conceptualizations of perceived interactivity are incomplete, others include aspects that have nothing to do with the concept. This is precisely the case of perceived control considered as a principal facet of perceived interactivity [3],[4],[5],[6] whereas it represents an emotional aspect.

The relationship of perceived interactivity with its indicators is often considered in terms of the reflexive model, while it is more appropriate to consider it in light of the formative one. Identifying the exact nature of the relationship between the latent construct and its indicators is of crucial importance [7]. Without this identification, it is quite possible to obtain erroneous and contradictory results.

This research aims to develop a general framework for the conceptualization of perceived interactivity. This framework takes into account the measurement problems inherent to this concept and aims to identify the exact relationship between perceived interactivity, his antecedents and his consequences. It tries to answer the question: to what extent the perceived interactivity, formed by reciprocity, responsiveness, speed and nonverbal information influences the experiential value of a commercial web site?

Initially, we attempt to clarify the concept. Secondly, the formative nature of perceived interactivity will be demonstrated. Then the theoretical link between perceived interactivity and its consequences will be developed. The validation process of structural links will be described later. Finally, managerial implications, limitations and future avenues of research will be enumerated.

2 BACKGROUND

2.1 DEFINITION OF PERCEIVED INTERACTIVITY

Ref. [8] proposes a conceptualization that best describe the perceived interactivity. According to this conceptualization, perceived interactivity is the "extent to which an operator engaged in a communication perceive it as reciprocal, responsive, fast and characterized by the use of non-verbal information".

The exchange of roles characterizes *reciprocity* [9],[10]. The interaction between the individual and the new communication systems is a process that can be initiated, continued and completed by either of these two operators.

Receptivity is mainly related to the way in which the consumer perceives an interactive system meets his inputs [11],[12],[1],[4]. The system able to provide adequate and contingent feedback will be perceived as interactive.

The immediacy of the response refers to the ability of the media to allow immediate feedback, or its ability to facilitate the rapid convergence between input and response [13].

In the particular context of the Internet, *non-verbal communication* refers to the use of graphics, animations, images, videos, music and paralinguistic codes to present information [8]. The use of either of these methods should allow understanding the message communicated.

2.2 WHAT IS THE RELATIONSHIP BETWEEN PERCEIVED INTERACTIVITY AND ITS FACETS?

2.2.1 TWO DIFFERENT APPROACHES TO MEASURE THE PERCEIVED INTERACTIVITY

The relationship between perceived interactivity and its facets is ambiguous. Many researchers [3],[4],[5],[14],[15] consider this relationship in terms of the reflective measurement model, [16] [8] study it in the light of the formative model.

The choice of the measurement model relies more on the researcher's beliefs than on the construct's characteristics. Nevertheless, some constructs are basically formed by their indicators and it is inappropriate to consider them in terms of the reflective model [17]. Adopting reflective indicators when formative ones are more appropriate leads necessarily to errors in the model specifications measurement [18].

A measurement model specifies the relationship between latent constructs and their observable measures [19] Reflexive and formative measurement models differ in terms of the relationship' direction between the latent variable and its manifest indicators. Under the rules of reflexive models, indicators reflect the latent variable while they contribute to its formation, according to formative models [7], [20], [21].

When considering a multidimensional construct, it is necessary to distinguish between (at least) two levels of analysis, a level that connects the manifest indicators to first order dimensions and a second level that connects these dimensions to the second order latent construct [20], [22].

2.2.2 INTERACTIVITY IS A REFLEXIVE FIRST ORDER, FORMATIVE SECOND ORDER CONSTRUCT

Ref. [23] enumerates a set of criteria, to distinguish formative measures from reflexive ones, appropriate for the first and the second order levels. These criteria consists of three main points (1) The nature of the construct (2) the direction of causality between indicators and the latent construct and (3) the characteristics of indicators measuring the construct.

Regarding the first criterion, according to reflective model, the latent construct exists independently of its indicators [24], [25] instead, and according to formative model, the indicators give meaning to the latent construct [19]. To define operationally interactivity, it was necessary to identify its facets. Without this identification, it was impossible to specify the exact nature of the concept. These facets are defining characteristics that explain perceived interactivity [22].

The second criterion is concerned with the causality' direction between perceived interactivity and its indicators. Unlike the reflective patterns, in the case of the formative models, the direction of causality is from the indicators to the construct [20]. Changes in the indicators should cause changes in the construct. For example a communication perceived as interactive doesn't necessarily means that the latter is perceived as rich in non-verbal information. It is time priority [26].

The third criterion is related to the exact nature of the indicators. For reflective models, indicators are interchangeable because they share a common theme. For formative models, indicators do not share a common theme. Each one captures a single conceptual aspects [22]. Adding or removing an item can significantly change the conceptual domain of the construct

[20],[19]. We studied interactivity in light of the most common facets described in the literature. These facets have not the same or similar content. Speed is necessarily different from the presence of non-verbal information, receptivity and reciprocity.

It seems that the perceived interactivity is a formative construct. In all ways, it is more easier to defend his formative than his reflective nature. This is a second-order latent construct formed by four facets. These facets are first order latent constructs related to observable measures. It follows the first hypothesis:

H1: Perceived interactivity is a second-order formative construct defined by four different facets.

2.3 TELEPRESENCE AND CONTROL: TWO PSYCHOLOGICAL STATES EXPERIENCED IN ONLINE ENVIRONMENTS

This research considers telepresence in terms of the subjective view according to which "telepresence is an experiential and an individual experience". Telepresence refers to the extent to which an individual feels physically present in a distant environment. It is enhanced by the reactions of the latter. It is a state and not a behavior. It is "the perceptual illusion of non-mediation" [27].

The impact of interactivity on telepresence is demonstrated [27],[28],[29], [30]. This research considers perceived interactivity as a variable formed by four facets. These facets enhance greatly the sense of non-mediation. It follows the second hypothesis:

H2: The interactivity positively influences telepresence

Control means "the ability of the user to participate voluntarily and influence instrumentally communication" [31]. This kind of control is called primary [32]. It is in contradiction with the secondary control experienced when the environment don't allow opportunities for action. In this case, individuals can only change their perceptions and preferences.

The perceived Interactivity increases the perceived level of control and interest [33],[34] ,[35]. Active control of the interaction is enhanced by reciprocity, rapid feedback, responsiveness and nonverbal information. A kind of synergy is created between these facets to achieve a single estimate of the web site interactivity. It is this synergy that enhances the feeling of dominance in the virtual world giving rise to the following hypothesis:

H3: Perceived Interactivity positively influences the perceived active control of the interaction

2.4 THE EXPERIENTIAL PERCEIVED VALUE OF A WEBSITE

Experiential value is defined as "A relative, personal, situational, preference characterizing the experience of a subject interacting with an object" [36],[37]. Commercial web sites are interactive environments of consumption. Visiting and shopping via these sites is an appealing experience. Therefore, it is proper to consider the value created from this experience based on the experiential approach.

There are several classifications of experiential value [36],[38],[39],[40] [41], [42], [43]. Ref. [42] operationalize the Holbrook theoretical classification of experiential value in traditional and virtual shopping malls. They vary this value based on two dichotomies: intrinsic / extrinsic and active / reactive. It results seven distinct experiential values. An exploratory qualitative research allowed us to choose among these values. Tunisian surfers appear to be sensitive to **enjoyment**, **efficiency** and **attractiveness**.

Enjoyment: the extent to which the execution of an activity is perceived as a source of joy and pleasure regardless of its functional consequences [44].

Attractiveness: the net, colors, graphics, and photo quality are combined to influence the visual attraction of a website [42]. These design elements are defined as the complex mix between technical and artistic sensibilities [45].

Efficiency: is measured by the ratio of outputs / inputs [36]. The outputs are the benefits of attending malls while the inputs are the sacrifices incurred for these benefits.

Perceived Interactivity affect positively the overall evaluation and attitude toward websites [3] [46],[47],[48]. Interactivity facilitates the collection of a significant amount of information about the products with less embarrassing ways than traditional methods [49]. This greatly enhances the utility and hedonic value of the site in the eyes of surfer. Hence, we propose the following hypothesis:

H4: Perceived Interactivity positively influences the experiential value of commercial websites (H4a, H4b; H4c)

When Living telepresence in an online environment, web user manifest a favorable predisposition towards the site [29], [50], towards the brand [51],[52],[53], [54] and towards advertising [53]. He get extrinsic as well as intrinsic gratifications from navigating through the website [50]. H5. Telepresence positively influences the experiential value of the commercial web site (H5a, H5b; H5C)

The control is assumed to be the functional part of the flow favoring essentially the achievement of shopping utility value [55],[56].We propose that control facilitates the achievement of the experiential value regardless of its utilitarian or hedonistic proprieties. The fluidity and automation of navigation made possible by controlling the interaction give the consumer some confidence allowing him to test his skills in pursuing intrinsic rewards that amuses and comforts him.

H6. Active control of the interaction positively influences the experiential value of the site (H6a; H6b; H6c).

The following model shows these different assumptions. This is a model that links perceived interactivity not only to its indicators but also to its consequences.

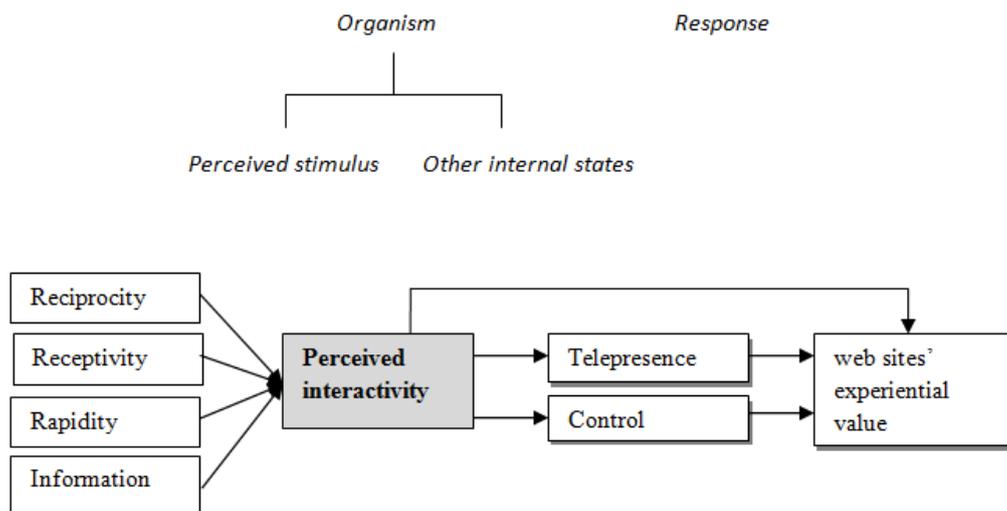


Fig1. The conceptual Model

3 MATERIAL AND METHODS

3.1 METHODOLOGICAL CHOICES AND DESCRIPTION OF THE EXPERIMENT

To select participants, the Convenience sampling procedure is used. A sample of 385 subjects is reached. Participants are expected to know how to navigate. This sample is divided into 30% men and 70% women. The age of participants is stored from 21 to 36 years with a mean age of 22 years. Of these, 75% follow a management license.

The experiment web site is rather existing which adds an authenticity to the research. The site is sufficiently challenging and interactive, to facilitate the achievement of utilitarian and hedonistic values. This is an e-commerce website selling digital cameras. The subjects were required to navigate the photogalerie.com website. Every subject was put in the situation where he needs a digital camera and really has the desire and intention to purchase it over the Internet, without, being obliged to make the purchase. After consulting the site, participants were invited to complete a questionnaire.

3.2 VARIABLE MEASURES

To measure perceived interactivity, [8] scale was judged appropriate. The development process of the scale is formal, other authors [3],[14] use less formal processes. The importance of this scale resides in its high level of reliability.

This research recognizes the subjectivity of telepresence. Ref.[57] developed a measurement scale composed of eight items that reflects this subjectivity. Ref.[58] adjusts the original scale of Kim and Biocca. They show that the reliability of this scale exceeds 0.75. This research adopts the adjusted scale of [58]. This is a seven-point Likert scale with seven items.

Ref. [5] developed a measurement scale that takes into account the multidimensional nature of perceived interactivity. It is a seven-point Likert scale. Four items are supposed to measure the active control. Statistical analyzes demonstrate the validity and reliability of this scale. The subscale measuring control had been retained as part of our research.

Ref. [42] developed seven sub-scales to measure dimensions of the experiential value of the site. Among these, three subscales measure enjoyment, attractiveness and efficiency. The scale is analyzed for its reliability and validity in two different shopping contexts, the virtual and the real one. It shows sufficient evidence of dimensionality, internal consistency and convergent and discriminant validity

4 RESULTS

4.1 VALIDATION OF FIRST ORDER REFLEXIVE ITEMS

Data collection was carried out in two stages. Initially 70 subjects participated in the experiment. An exploratory factor analysis was used to remove the items with unsatisfactory psychometric quality and to reformulate other items. Crombach's alpha was used as an internal consistency estimator.

A new sample of 385 subjects has been reached. We followed the recommendations of [59], [60] by using an exploratory factor analysis (EFA) and a confirmatory factor analysis (CFA). The EFA was performed on the variance-covariance matrix and varimax rotation. Three of the fourteen items measuring first order indicators of perceived interactivity had to be removed. It appears, four distinct dimensions with respect to the Kaiser eigenvalues criterion (1960). Shared variance explained by the factors are satisfactory and each item is highly correlated with its respective factor. These factors were retained for a second- order analysis.

The CFA is performed according to the method Maximum Likelihood. The construction of the measurement model of perceived interactivity is based on the results of the EFA. This model includes four latent variables and 11 manifest variables. The coefficient of Mardia shows that there is a multinormality problem. This coefficient is greater than three (18.889). The model was re-tested by creating 250 new samples according to the principles of the bootstrap method. This confirmatory test shows that it is possible to improve the quality of the measurement model. A modification by addition had to be performed. The results of the maximum likelihood method with *Bootstrap* show that even if the multinormality condition is violated, the results are stable. Figure 2 outlines the results of the factor analysis of perceived interactivity.

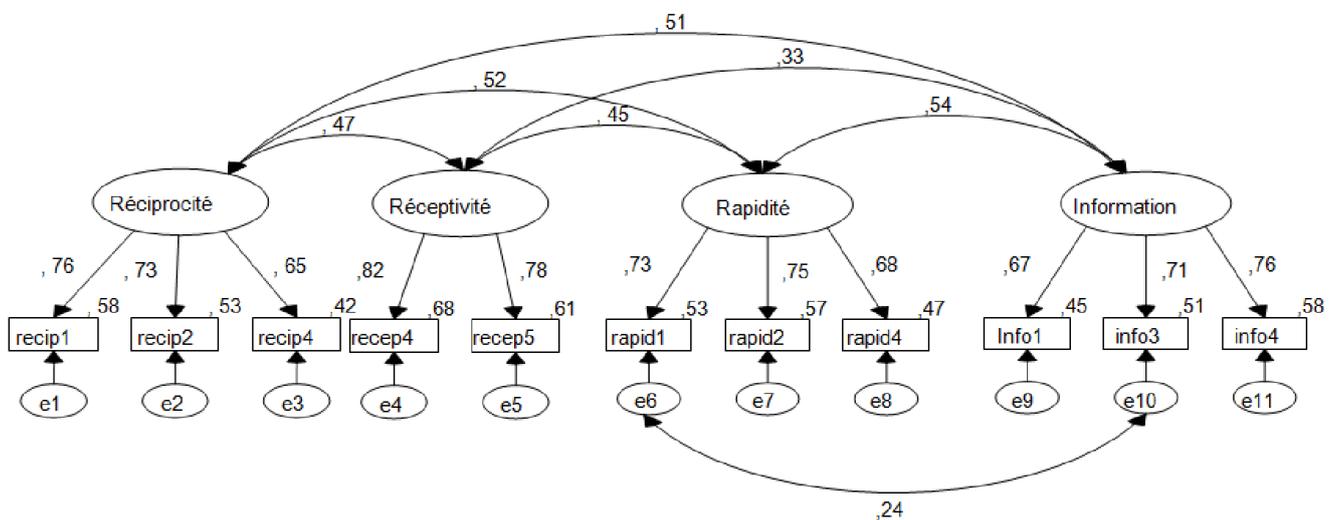


Fig2. Results of the factor analysis of perceived interactivity

The fit between the theoretical model and the data collected, appreciated by the fit indices presented in Table 1 is considered good [61].

Table 1. Adjustment Indices

chi-square / df	CFI	TLI	GFI	AFM	RMSEA
1,556	0.984	0.977	0.972	0.952	0,038

The reliability of the items and the discriminant and convergent validity were examined according to the criteria suggested [62]. The reliability of each construct is calculated. Values exceeding 0.70 for all facets of perceived interactivity. Shared average variance of these facets is greater than 0.5 (the minimum required for the convergent validity). Shared average variance of each construct is greater than the square of the correlation between the construct and all other constructs of the study, confirming that way the discriminant validity of the perceived interactivity' indicators. Based on the above, the first order reflective measures seem to be appropriate. All items are good indicators of the four facets of perceived interactivity.

4.2 VALIDATION OF THE FIRST-ORDER FORMATIVE INDICATORS

To validate the perceived interactivity formative indicators, we estimated a model relating perceived interactivity to two reflective indicators. This is a model for multiple indicators, multiple causes (MIMIC model) [63]. In this model, the indicators are the direct causes of the latent variable indicated by two reflexive measure. The first measure is given by the following expression: "Overall, I think the photo gallery website is highly interactive [64]. The second measure is given by "The web site "potogalerie.com" is interactive [8]. Before estimating the model it, was necessary to check for multicollinearity.

High correlations between formative indicators indicate that they measure the same thing. The value of 10 is the standard value beyond which multicollinearity problem can appear [65], [66], [67]. VIF values calculated for the four indicators of perceived interactivity vary from 1.225 to 1.393. This implies that there is no multicollinearity problem and model results will not be biased.

The results of the maximum likelihood method with *Bootstrap* show that, even if the multi-normality condition is violated, the results are stable. Table 2 reports the results without Bootstrap and the model fit indices. These indices are widely acceptable.

Table2. Validation of the first order formative indicators of perceived interactivity

Relationships		Maximum Likelihood			
		Coef. Stall	CR	P	
Measurement model linking perceived interactivity to its indicators					
Reciprocity →	Interactivity	0.373	-	-	
Receptivity →	Interactivity	0.197	2,690	0,007	
Speed →	Interactivity	0.294	3,025	0,002	
Information →	Interactivity	0.057	0.864	0.864	
Structural model linking perceived interactivity to two reflective items.					
Interactivity →	Inter-Global1	0.962	5,521	0,000	
Interactivity →	Inter-global2	0.858	5,399	0,000	
Adjustment indices					
chi-square / df	CFI	TLI	GFI	AFM	RMSEA
2,262	0.966	0.952	0.953	0.923	0.057

The purpose of this phase is to determine the weight of each facet in the formation of perceived interactivity. The results show that reciprocity, responsiveness and speed have significant weights. R2, which indicates the extent to which the formative measurement model covers the conceptual domain of the construct [21] is 0.67, which is acceptable. The theoretical importance of nonverbal information has not been supported by the results this implies that non-verbal information is necessary but not a sufficient condition to enhance the perception of interactive properties. However, we have decided to use all these aspects to ensure the content validity of the construct.

4.3 SECOND-ORDER CONSTRUCT VALIDATION

The main purpose of this phase is to validate the second order construct. The coefficient of Mardia shows a multinormality problem. The model was re-tested by creating 250 new samples according to the principles of the Bootstrap method. The results of the maximum likelihood method with *Bootstrap* show that, even if the multi-normality condition is violated, the results are stable. The following table reports the results without Bootstrap and the model fit indices. These indices are in the majority, acceptable.

Table3. The structural model validation

Relationships		Maximum Likelihood			
		Coef. Stall	CR	P	
Measurement model linking perceived interactivity to its indicators					
Reciprocity →	Interactivity	0.493	-	-	
Receptivity →	Interactivity	0.121	1,655	0.098	
Speed →	Interactivity	0,160	1,890	0.059	
Information →	Interactivity	0.284	2,883	0,004	
Structural model linking interactivity to its consequences					
Interactivity →	Efficiency	0.499	4,734	0,000	
Interactivity →	Attractiveness	0.893	5.865	0,000	
Interactivity →	Enjoyment	0.446	4.571	0,000	
Interactivity →	Telepresence	0.453	4.789	0,000	
Interactivity →	Control	-0.314	-3933	0,000	
Telepresence →	Enjoyment	0.201	3,138	0,002	
Telepresence →	Efficiency	0.307	4,488	0,000	
Attractiveness →	Control	0.116	2,005	0,045	
Enjoyment →	Control	-0.103	-1.826	0.068	
Adjustment indices					
chi-square / df	CFI	TLI	GFI	AFM	RMSEA
1,868	0.939	0.929	0.919	0.881	0.048

H1 was accepted since reciprocity ($\beta = 0.493$), responsiveness ($\beta = 0.121$, $p < 0.1$), timeliness ($\beta = 0.160$, $p < 0.1$) and nonverbal information ($\beta = 0.284$; $p < 0.01$) have significant effects on perceived interactivity. Reciprocity is the most important determinant of perceived interactivity followed by nonverbal information. The four facets constitute 0.705 of the second order construct variance, which is acceptable.

The H2 hypothesis was supported. Interactivity seems to influence positively perceived telepresence. The H3 hypothesis was disproved and perceived interactivity negatively influences perceived control.

The H4 hypothesis was supported. Interactivity significantly influences perceived efficiency ($\beta = 0.499$; $p < 0.001$); attractiveness ($\beta = 0.893$; $p < 0.001$) and enjoyment (0.446; $p < 0.001$). Hypotheses H5 and H6 were partially supported.

It should be noted that the explanatory power of the model is too satisfactory, it is given by the following percentages.

Table 4. Explanatory power of the model

	Interactivity	Telepresence	Control	Efficiency	Enjoyment	Attractiveness
SMC (%)	73.4	20.5	10	48.2	36.6	74.6

5 DISCUSSION

This research is an empirical support for the conceptualization of perceived interactivity as a second-order formative construct. It shows also the predictive power of this construct.

The formative nature of perceived interactivity:

The formative indicators of perceived interactivity are an integral part of this variable. Perceived Interactivity is determined mainly by the reciprocal interaction and non-verbal information. The speed of interaction and responsiveness also contribute to the formation of this construct but their weight is less important.

Reciprocity refers to the extent to which users believe that the site facilitates two-way communication [68], [69] This research reinforces the role of reciprocity in the formation of perceived interactivity and shows that it is the key facet of perceived interactivity when the experiential value of the site is the dependent variable.

The presence of non-verbal information is a facet of perceived little discussed in the literature. The results show that it is an important indicator that contributes greatly to the establishment of the perceived interactivity index. Our results are consistent with those of [8].

The perceived speed of interaction is the most cited facet in the literature on the perceived interactivity [31], [47], [70], [16], [8]. It appears that the more quick the interaction with the site is perceived, the more important the perception of interactivity would be.

Based on the interpersonal communication model [68], the quality of the exchange of messages is the key to interactivity. Ref. [48] demonstrate that the quality of the message enhance perceived interactivity and site effectiveness. Although responsiveness is one facet that contributes to the formation of perceived interactivity, its contribution is less important than any other facets. By varying the dependent variable, it is possible to achieve a greater weight of this indicator.

Perceived interactivity and online shoppers responses:

Interactivity is defined in the literature as one of the key benefits of the Internet [71], [72], [73]. This research reinforces this conclusion. The impact of perceived interactivity on experiential value is not only significant but also high. The impact of interactivity on the utility value is discussed widely. This research shows that the impact of perceived interactivity on the active site utility value is more important than its impact on active hedonic value. The interactivity also enhances the perceived involvement in the virtual world and inhibits the control of interaction. Overall, these findings are consistent with our expectations and focus on the crucial role of the shopping atmosphere in achieving a rewarding experience.

6 CONCLUSION

The purpose of this research is to display the predictive power of perceived interactivity. The development of the conceptual framework took into account the relation between this concept and its facets. Several criteria make the formative approach the optimal alternative to best describe this complex concept. Empirical tests confirm this view and emphasize the need to consider perceived interactivity as a formative second-order construct entirely defined by its indicators. The same tests consolidate the undeniable impact of perceived interactivity on online shoppers responses.

6.1 CONTRIBUTION OF RESEARCH

Formative measurement models were introduced in the literature for over 40 years and discussion of methodological issues has increased since 1990. The use of formative indicators to measure constructs in empirical studies are scarce. There is not enough papers that focus on the utility of formative scales. The results illustrate a proper use of the rules of construction of formative indicators [18].

Regarding perceived interactivity, little research are concerned with the specification of the exact nature of the relationship between the construct and it's indicators. Generally researchers follow, blindly, the reflexive approach. Ref.[16] emphasized the need to develop perceived interactivity as a formative construct caused by its indicators. Ref.[8] show empirically that perceived interactivity is a formative second order construct when the dependents variables are involvement and attitude. In the light of a set of criteria, this research was able to show that perceived interactivity is a formative second-order construct, dismissing this way reflective approach.

6.2 MANAGERIAL IMPLICATIONS

The allocation of marketing resources and communication programs may be affected given different conceptualizations methods applied by practitioners. Under the formative model, resources can be allocated mainly to improve reciprocity and increase the non-verbal information. These two aspects of perceived interactivity contribute remarkably to the formation of perceived interactivity when experiential perceived value is involved. Considering a non important aspect as important has harmful effects on managerial decisions. It involves harmful financial waste especially for firms suffering from budget constraints.

6.3 LIMITATIONS

Limits marked this search. The list of indicators of interactivity may not be exhaustive. A less than 1 square R (0.705) implies the existence of other indicators of perceived interactivity.

Although developed in a rigorous way, the experiential value scale is limited by a restricted number of items for each value.

The data collection method is also problematic. It was not possible to conduct a laboratory experiment. It remains the most suitable method to have unbiased results.

6.4 FUTURE DIRECTIONS OF RESEARCH

The conceptualization of a construct should be based on theory and precede any discussion of structural relationships between constructs. Future studies are expected to emphasize the measurement model conceptually appropriate. It is imperative to develop a measurement model with adequate specification that may represent the conceptual definition of a construct to avoid any kind of mistakes.

Future researches may apply the formative approach in other marketing contexts and may explore the role of perceived interactivity in these contexts.

It is also possible to study the extent to which perceived interactivity differs among cultures and types of consumers.

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