COMPARISON OF PERCEIVED INTERACTIVITY MEASURES OF ACTUAL WEBSITES INTERACTIVITY

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Case study

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Abstract: Interactivity is a concept of enormous importance for digital marketing. It was recognized as a key feature of website, a hub of all digital marketing activities. But, almost all interactivity measures were conceptualized one or two decades ago. In the meantime, technological novelties changed the face of websites. Also, a number of interactivity features increased exponentially. Those changes had a huge impact on practice and could influence user's perception of interactivity. Aim of this paper is to explore whether several selected existing measures of perceived interactivity could cope with those changes. Paper reports a study in which two websites of low and high interactivity were developed and in an experimental setting as stimuli used to test three perceived interactivity measures. Results show that all measures estimated perceived interactivity of a high interactivity website better than of a low interactivity website. Also, results show that particular dimensions of a model could be used to estimate overall interactivity.

Keywords: website interactivity, perceptual interactivity, actual interactivity, interactivity measures, website design.

INTRODUCTION

Interactivity was recognized as the most significant feature of the internet and new media [20, 27]. From the early days of internet, various digital systems have been flooding the market. Interactivity and promises that interactive digital systems offered to users were most important factors that had influenced consumer decision to buy. During 1980s researchers began to study interactivity. Many of them successfully defined interactivity [6, 7, 9, 14, 18, 19, 21, 25, 30, 36], but from different backgrounds and perspectives. Researchers have agreed on the subject that interactivity is complex and multidimensional concept. But there is no consensus about dimensions and elements of interactivity.

Interactivity has numerous positive effects, like acceptance and satisfaction [21]. McMillian [19] stated that interactivity affects the attitude towards the website, the relevance of the topics on the site, returning to the Web site, inviting others on the web site, and purchasing from the website. Interactivity also affects better processing of information on the website and better processing of product information. In order to achieve positive effects in practice, it is necessary to be careful with the implementation. All dimensions of selected model should receive adequate attention. But for practitioners appropriateness of a particular model is always a question. On e more difficulty for practice is that only several measures of interactivity exist.

Paper is organized as follows. First we review selected definitions of interactivity and measures of interactivity. Then we describe details of our research: population, procedure, and stimuli. Next, we present results of our research. Finally, we discuss our research as well as the implication for marketing researchers and practitioners.

Interactivity

As we mentioned earlier, interactivity has been recognized as the most important feature of the new digital media. However, interactivity soon became synonymous with the Web, so the terms like Web marketing and Web advertising has become an Interactive marketing and Interactive advertising [18]. Mohammed et al. [20] argue that interactivity provides such level of a dialogue that has not been previously known in the history of business. The importance of the concept created enormous interest among researchers.

Rogers [25] provided one of the first definitions of interactivity. He defined interactivity as "the capability of new communication systems (usually containing a computer as one component) to 'talk back' to the user, almost like an individual participating in a conversation".

Rafaeli based his definition on the concept of possible response rate as a measure of media capability to accept and react to responses given to the user, i.e. measure to what extent one message in the exchange is based on previous messages. Rafaeli defined interactivity [21] as "an expression of the extent that, in a given series of communication changes, any third (or later) transmission (or message) is related to the degree to which previous exchanges referred to even earlier transmissions".

Steuer defined interactivity in the context of virtual reality as a determinant of telepresence. Interactivity [30] "is the extent to which users can participate in modifying the form and content of the mediated environment in real time".

Jensen [11] criticized previous practice of linking interactivity with technology. Jensen defined interactivity as "a measure of a media's potential ability to let the user exert an influence on the content and/or form of the mediated communication".

After comprehensive analysis of the technology and communication oriented definitions, Kiousis [14] defined interactivity as "as the degree to which a communication technology can create a mediated environment in which participants can communicate (one-to-one, one-to-many, and many-to-many), both synchronously and asynchronously, and participate in reciprocal message exchanges (third-order dependency). With regard to human users, it additionally refers to their ability to perceive the experience as a simulation of interpersonal communication and increase their awareness of telepresence."

Yadav and Varadarajan [35] defined domain specific definition in the field of electronic marketplaces. Interactivity "in the electronic marketplace is the degree to which computer mediated communication is perceived by each of the communicating entities to be (a) bidirectional, (b) timely, (c) mutually controllable, and (d) responsive."

Johnson, Bruner, and Kumar [13] defined interactivity as "the extent to which an actor involved in a communication episode perceives the communication to be reciprocal, responsive, speedy, and characterized by the use of nonverbal information."

By analyzing all this definitions it is obvious that interactivity is complex and multidimensional concept. Certain definitions describe it as one-dimensional, some as two, three, and four, even as a concept with six dimensions [11]. For practitioners a larger number implies more efforts, and it is easier to analyze and develop particular digital system using less interactivity dimensions. One more difficulty for practice is a fact that interactivity can be actual and perceptual [17, 29, 32, 33, 34]. Actual interactivity, sometimes called structural or objective or feature based interactivity is potential in a medium for interaction [33]. Actual interactivity was operationalized as presence or absence of some interactivity features [29]. Perceived or subjective interactivity can be defined as a psychological state experienced by the user in the process of interaction [33].

Measuring interactivity

Although many studies have been dealing with modeling of interactivity, only several instruments for measuring interactivity exist [17, 18, 29, 32, 34]. Measures for perceived interactivity used in this research were developed by Liu [17], Wu [34], and Song and Zinkhan [29] and they are explained subsequently in details.

Author Liu [17], developed an instrument based on conceptualization of interactive communication as a "communication that offers individuals active control and allows them to communicate both reciprocally and synchronously". Measure includes twelve items within 3 dimensions (Figure 1) of interactivity: active control, two-way communication, and synchronicity. Special care was taken to secure

that scale does not contain any attitudinal or behavioral intentions.

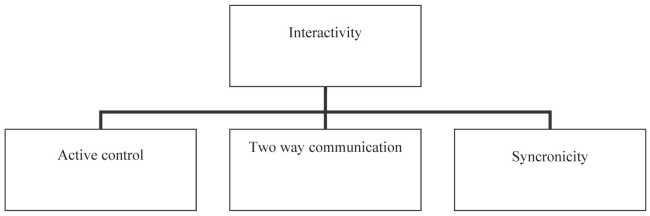

Figure 1. *Liu dimensions of interactivity*

Wu [34] instrument measures interactivity using three dimensions (Figure 2) of website perceived intractivity: perceived control, perceived response, and perceived personalisation. Perceived control reflects users ability and confidence in performing activities and it assumes aspects of website navigation, the pace or rhythm of the interaction, and the content being accessed. Perceived response represents users perception of how the interactive system reacts to his/her inputs. Those responses could be from the site owner, from the navigation cues and signs, and from the real people online. Perceived personalisation is related to the extent to which users perceived appropriateness of the responses of his partner in communication as personally relevant to his communicative behaviours. Perceived personalization is analyzed through website as if it **is a** person, as if it wants to know visitor, and as if it understands the user. Instrument uses 9 statemens, 3 statemenst for each dimension.

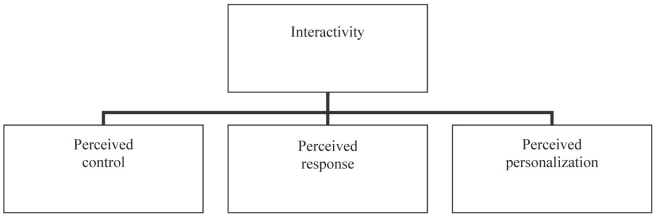

Figure 2. *Wu dimensions of interactivity*

Authors Song and Zinkhan [29] using telepresence theory and interactivity theory developed instrument for measuring interactivity as a combination of Wu [32], McMillan and Hwang [18], and Liu [17] instruments. Instrument uses following dimensions (Figure 3) for measuring perceived interactivity: perceived communication, perceived control, and perceived responsiveness. Instrument has 21 items in total. Nine items are used for perceived control, whereas six items are used for perceived response and perceived communication.

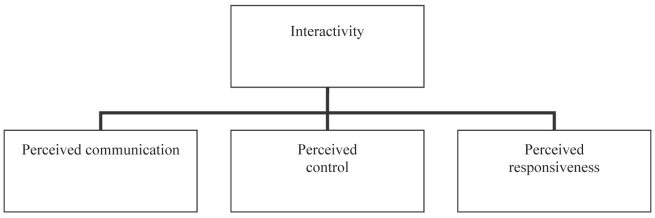

Figure 3. *Song and Zinkam dimensions of interactivity*

RESEARCH METHODOLOGY

Participants

Participants were 120 undergraduate students selected in the pretest among the students of the freshman year at the School of Electrical Engineering of Applied Studies in Belgrade. Total number of 120 participants was divided into two groups using the principle of random selection. The equal number of males and females participated in the study. Before conducting analysis some cases were excluded from the analysis. Excluded cases had missing values and values out of the specified range. After exclusion, the number of cases employed in further analysis was 99. Table 1 shows age structure.

Table 1. *Age structure of participants*

Age	Participants (%)
Up to 20	72,6%
21-25	23,9%
26-30	2%
31-40	1%
Over 40	0,5%

Tables 2 and 3 show participants experience measured by the number of years someone is using the internet and hours per week spent on the internet.

Table 2. *Number of years participant is using the internet*

Years of use	Participants (%)
Less than 2	1%
2-4	5%
5-6	23,4%
More than 6	70,6%

Table 3. *Hours per week participant spent on the internet*

Hours per week	Participants (%)
Less than 5	5,1%
6-20	24,9%
21-40	41,6%
More than 40	28,4%

It could be concluded from the previous tables that participants were males and females of different age groups, who use the internet from 1 to over 6 years and spend from 1 to more than 40 hours per week surfing the web.

Procedure

We conducted laboratory experiment with the aim to test selected measures of interactivity (Liu, Wu, and Song and Zinkhan) on two variants of a fictious website (low and high interactivity). Participants were recruited through pretest, using pretest questionnaire. The aim of the pretest was to identify participants as internet users with experince, and their prefered content on the internet. Prefered content was important for the development of stimuli for main research - fictious websites.

Main research was conducted in laboratory settings. Participants were randomly asigned to experimental conditions. Then, participants were informed about the study and their task. Their task was to browse website and search for the content of interest and if they found what they want to apply for training, job or internship. Participants had 30 minutes to complete the task. After they had completed the task, they received a questionnaire to fill out. It took them aproximately 20 minutes to complete the questionnaire.

Research stimuli

Fictious web site with two versions (high interactivity and low interactivity) was developed as a research stimulus [1, 12, 13, 16, 17, 18, 29, 34]. Website content was determined during the pretest, as a most relevant content from the respondents point of view. Most relevant content for a majority of respondents were informations about trainings, internships and jobs. According to pretest, two fictious portals for trainings, internships and jobs were developed.

Websites had the same content, and the difference between websites was a level of interactivity. Interactivity manipulation was created according to recommendations presented in various researches [13, 15, 24, 28]. Websites were created using well known content management system WordPress, using template *Medicine* (version 1.0.3). High interactivity version had more interactive features than low interactivity version. Those interactive features that were integrated into the high interactivity website are: option to recommend the site to friends, option to apply for training/internship/job online, site map, e-mail hot link, on-line chat room, dynamic menu, site search, tagging, option to make a comment on the offer, sharing content via social media sites, and newsletter registration.

Low interactivity version has the following structure: Home page, Trainings section, Internships section and Jobs section. Home page contains posts with short description of actual offer from all sections of the site, job offer, internships and trainings respectively, with the link to landing page and they are organized in reverse chronological order. Beside posts, home page contains instruction with explanation of the research purpose and participant task. Disclaimer which explains the site intention is located in the footer of the site. Add-ins, positioned above the footer, contain calendar and categories offers. Other website sections and pages within sections (jobs, trainings and internships) have the same structure as home page. In the central part are posts from one of the aforementioned categories organized in reverse chronological order. Auxiliary block contains instructions. Header has the same structure as in home page. Low interactivity website page layout is shown in Figure 4.

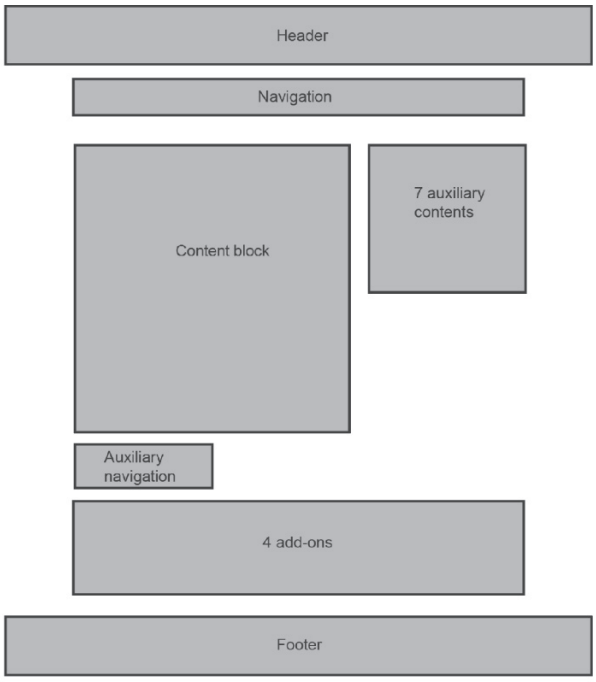

Figure 4. *Layout of low interactivity website page*

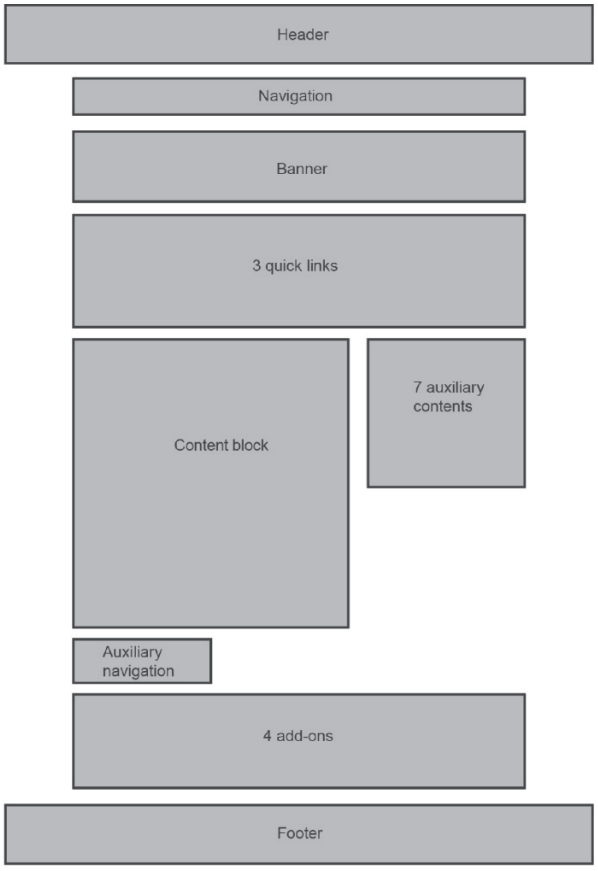

Figure 5. *Layout of high interactivity website page*

High interactivity version has the following structure: Home page, Trainings section, Internships section, Jobs section, and 24hrs support. Home page contains posts like low interactivity version. Above the post block are located quick links and a banner block. Page contains 24hrs support, a registration to mailing list, Facebook social plugin, comments block, and the most wanted jobs and tags. Footer is the same as on low interactivity version. Add-ins are above footer. Section pages (jobs, trainings and internships) have the same structure as the home page, except for the shortcut links. There are single offer pages (shown on the left hand side) and pages 24hrs support which do not contain shortcut links and help navigation (displayed on the right hand side). Offer landing page opens from the navigation bar or by selecting offer from certain category. At the bottom of the offer page, users are provided with the possibility to register for selected offer using web form and to subscribe to a mailing list. Beneath the subscription form recommended offer banners and commenting fields are located. Sharing offers via social networks, Gmail and mail of user's client are offered below the picture that describes the offer and below subscription to a mailing list. Figure 5 shows the layout of high interactivity site.

RESULTS

Total number of cases used in the analysis was 99 (51 low interactivity website, 48 high interactivity website). First, we assessed all instruments for reliability using coefficient alpha (Cronbach's alpha). Cronbach's alpha shoud have the value of 0.7 or more. Cronbach's alpha for Liu instrument was 0.943, for Wu instrument was 0.903, and for Song and Zinkam instrument was 0.876. Since all scores were larger than 0.7, therefore the instruments have high reliability. Then we calculated Cronbach's alpha for all instrument dimensions. Values are presented in Table 4, Table 5 and Table 6 respectively for Liu, Wu, and Song and Zinkam instrument. All values are equal or exceed 0.7.

Table 4. *Cronbach's alpha for Liu measure dimensions*

Dimension	Alpha
Active control	0.7
Two-way communication	0.8
Syncronicity	0.78

Table 5. *Cronbach's alpha for Wu measure dimensions*

Dimension	Alpha
Perceived control	0.81
Perceived responsiveness	0.83
Perceived personalization	0.7

Table 6. *Cronbach's alpha for Song & Zinkan measure dimensions*

Dimension	Alpha
Perceived communication	0.83
Perceived control	0.76
Perceived responsiveness	0.7

Next we compared Liu, Wu, and Song and Zinkan measures of interactivity for participant of low interactivity versus high interactivity website. Participants show statisticaly significant ($p<0.05$) difference for all instrument for high interactivity website relative to low interactivity website (Table 7). Figure 6 graphically shows for all models the difference between mean values for high interactivity website relative to low interactivity website. The highest mean value obtained Song and Zinkan model, and Wu model obtained the lowest.

Table 7. *T-test results for different interactivity measures*

	Website variant	M	SD	t	p
Liu	High interactivity	5.097	0.536	8.039	.000
	Low interactivity	4.264	0.492		
Wu	High interactivity	4.956	0.647	7.038	.000
	Low interactivity	3.970	0.747		
Song & Zinkan	High interactivity	5.187	0.610	5.636	.000
	Low interactivity	4.485	0.629		

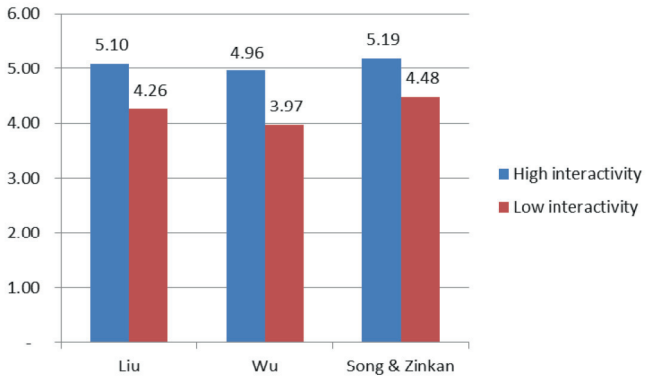

Figure 6. *Graphical representations of mean data for interactivity measures*

Then we analyzed each particular dimension of the model between participants who used low interactivity and high interactivity website. Table 8, Table 9, and Table 10 show results for these models. All dimension values between participants of low and high interactivity website were statistically significant ($p<0.05$). As tables show, Liu dimension *Active control*, Wu dimension *Perceived control*, and Song and Zinkan dimension *Active control*, obtained higher mean value. These results suggest that there is a consistency of control dimension between different models. Liu *Two-way communication* dimension and Song & Zinkan dimension *Perceived communication* obtained the lowest mean values confirming that partial consistency between models exists. Other dimensions are not comparable.

Table 8. *T-test results for dimensions of Liu model*

Liu model					
	Website version	M	SD	t	p
Active control	High interactivity	5.451	0.767	3.086	.003
	Low interactivity	4.854	1.133		
Two-way communication	High interactivity	4.618	0.973	6.514	.000
	Low interactivity	3.281	1.069		
Synchronicity	High interactivity	5.388	0.872	2.286	.024
	High interactivity	5.451	0.767		

Table 9. *T-test results for dimensions of Wu model*

Wu model					
	Website version	M	SD	t	p
Perceived control	High interactivity	6.157	0.731	3.401	.001
	Low interactivity	5.431	1.326		
Perceived responsiveness	High interactivity	4.500	1.034	3.815	.000
	Low interactivity	3.688	1.085		
Perceived personalization	High interactivity	4.327	1.344	4.894	.000
	Low interactivity	3.028	1.293		

Table 10. *T-test results for dimensions of Song & Zinkan model*

Song & Zinkan model					
	Website version	M	SD	t	p
Perceived communication	High interactivity	4.510	1.074	6.306	.000
	Low interactivity	3.097	1.155		
Perceived control	High interactivity	5.885	0.685	3.861	.000
	Low interactivity	5.162	1.137		
Perceived responsiveness	High interactivity	5.124	0.745	2.169	.033
	Low interactivity	3.028	1.293		

Graphical representations for all model dimensions between participants who used low interactivity and high interactivity website are shown in Figure 7, Figure 8, and Figure 9.

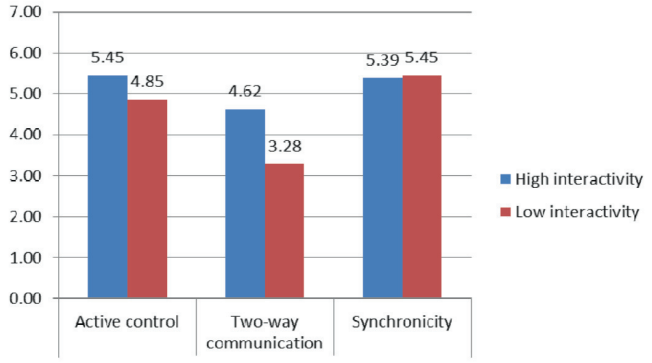

Figure 7. *Graphical representations of mean data for Lui model dimensions*

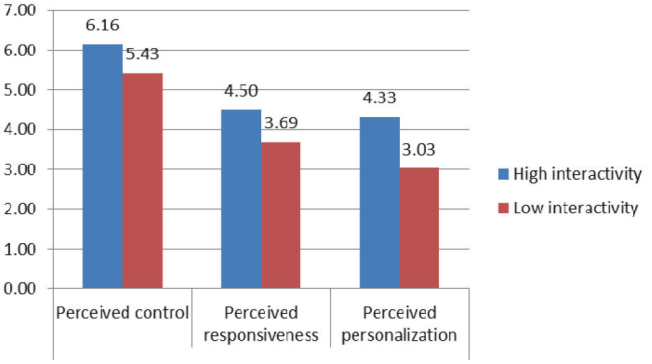

Figure 8. *Graphical representations of mean data for Wu model dimensions*

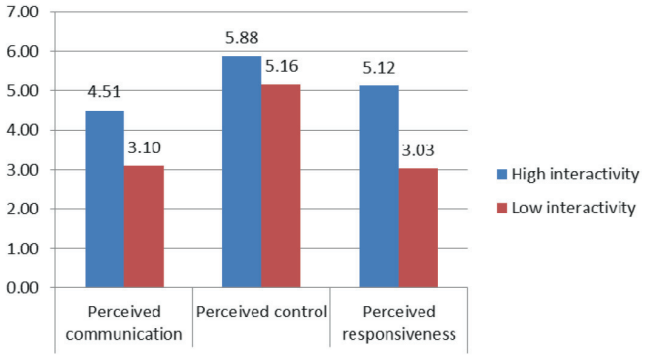

Figure 9. *Graphical representations of mean data for Song & Zinkan model dimensions*

We also analyzed for selected models every particular question for low interactivity website and high interactivity website. First, we analyzed Liu model, then Wu model, and Song & Zinkan model. Results are shown in Table 11, Table 12, and Table 13.

Table 11. *Responses of the participants of low interactivity and high interactivity site for Liu model*

	Website version	M	SD
Active control			
I felt that I had a lot of control over my visiting experiences at this website.	High interactivity	5.098	1.315
	Low interactivity	4.417	1.674
While I was on the website, I could choose freely what I wanted to see.	High interactivity	6.431	1.005
	Low interactivity	5.875	1.684
While surfing the website, my actions decided the kind of experiences I got.	High interactivity	5.471	1.332
	Low interactivity	4.708	1.429
While surfing the website, I had absolutely no control over what I can do on the site.	High interactivity	4.804	2.050
	Low interactivity	4.417	1.855
Two-way communication			
This website facilitates two-way communication between the visitors and the site.	High interactivity	4.745	1.339
	Low interactivity	3.750	1.995
The website makes me feel it wants to listen to its visitors.	High interactivity	4.294	1.932
	Low interactivity	2.333	1.521
Site created the feeling that it wants to listen to its users	High interactivity	4.941	1.462
	Low interactivity	3.771	1.547
The website gives visitors the opportunity to talk back.	High interactivity	5.196	1.096
	Low interactivity	3.521	1.624
It is difficult to offer feedback to the website.	High interactivity	4.373	1.296
	Low interactivity	3.333	1.492
The website does not at all encourage visitors to talk back.	High interactivity	4.157	1.869
	Low interactivity	2.979	1.828
Synchronicity			
The website processed my input very quickly.	High interactivity	5.157	1.155
	Low interactivity	4.667	1.404
Getting information from the website is very fast.	High interactivity	5.667	1.194
	Low interactivity	5.354	1.280
I was able to obtain the information I wanted without any delay.	High interactivity	5.549	1.137
	Low interactivity	5.083	1.350
When I clicked on the links, I felt I was getting instantaneous information.	High interactivity	5.098	1.664
	Low interactivity	4.792	1.320
The website was very slow in responding to my requests.	High interactivity	5.471	1.759
	Low interactivity	4.958	1.924

Table 12. *Responses of the participants of low interactivity and high interactivity site for Wu model*

	Website version	M	SD
Perceived control			
I was in control of my navigation through this website.	High interactivity	6.275	1.185
	Low interactivity	5.396	1.865
I had some control over the content of this website that I wanted to see.	High interactivity	6.275	1.060
	Low interactivity	5.375	1.721
I was in total control over the pace of my visit to this website.	High interactivity	5.922	1.246
	Low interactivity	5.521	1.304
Perceived responsiveness			
I could communicate with the company directly for further questions about the company or its products if I wanted to.	High interactivity	4.294	1.932
	Low interactivity	2.333	1.521
I could communicate in real time with other customers who shared my interest in this website.	High interactivity	4.333	1.873
	Low interactivity	2.771	1.801
The site had the ability to respond to my specific questions quickly and efficiently	High interactivity	5.196	1.096
	Low interactivity	3.521	1.624
Perceived personalization			
I perceived the website to be sensitive to my needs for product information.	High interactivity	3.804	1.470
	Low interactivity	3.854	1.502
I felt I just had a personal conversation with a sociable, knowledgeable and warm representative from the company.	High interactivity	4.353	1.585
	Low interactivity	3.979	1.657
The Web site was like talking back to me while I clicked through the website.	High interactivity	5.098	1.664
	Low interactivity	4.792	1.320

Table 13. *Responses of the participants of low interactivity and high interactivity site for Song & Zinkan model*

	Website version	M	SD
Perceived communication			
This Web site facilitates two-way communication.	High interactivity	4.745	1.339
	Low interactivity	3.750	1.995
The Web site gives me the opportunity to talk back.	High interactivity	4.294	1.932
	Low interactivity	2.333	1.521
The Web site facilitates concurrent communication.	High interactivity	4.333	1.873
	Low interactivity	2.771	1.801
The Web site enables conversation.	High interactivity	4.333	1.956
	Low interactivity	3.229	1.666
The site is effective in gathering visitors' feedback.	High interactivity	5.196	1.096
	Low interactivity	3.521	1.624
The Web site does not encourage visitors to talk back.	High interactivity	4.157	1.869
	Low interactivity	2.979	1.828
Perceived control			
While I was on the site, I was always aware where I was.	High interactivity	6.177	1.260
	Low interactivity	5.313	1.959
While I was on the site, I always knew where I was going.	High interactivity	6.098	1.082
	Low interactivity	5.208	1.821
While I was on the site, I could choose freely what I wanted to see.	High interactivity	6.431	1.005
	Low interactivity	5.875	1.684
While surfing the site, my actions decided the kind of experiences I got.	High interactivity	5.471	1.332
	Low interactivity	4.708	1.429
While I was on the site, I was always able to go where I thought I was going.	High interactivity	6.059	1.139
	Low interactivity	5.250	1.644
I was delighted to be able to choose which link and when to click.	High interactivity	6.137	1.510
	Low interactivity	5.625	1.482
While surfing the site, I had absolutely no control over what I could do on the site.	High interactivity	4.804	2.050
	Low interactivity	4.417	1.855
The Web site is not manageable.	High interactivity	5.902	1.285
	Low interactivity	4.896	1.741
I feel that I have a great deal of control over my visiting experience at this site.	High interactivity	5,098	1,315
	Low interactivity	4,417	1,674
Perceived responsiveness			
The Web site processed my input very quickly.	High interactivity	5.157	1.155
	Low interactivity	4.667	1.404
Getting information from the Web site is very fast.	High interactivity	5.667	1.194
	Low interactivity	5.354	1.280
I was able to obtain the information I want without any delay.	High interactivity	5.549	1.137
	Low interactivity	5.083	1.350
When I clicked on the links, I felt I was getting instantaneous information.	High interactivity	5.098	1.664
	Low interactivity	4.792	1.320
The Web site was very slow in responding to my request.	High interactivity	5.471	1.759
	Low interactivity	4.958	1.924
The Web site answers my question immediately.	High interactivity	3.804	1.470
	Low interactivity	3.854	1.502

Conclusion

As we emphasized in previous sections, interactivity is a multidimensional and complex concept. Additional difficulty is a fact that interactivity can be actual and perceptual. Actual interactivity can be operationalized by using different interactive fea-

tures. Recommendations are numerous, but sometimes confronting and out of date. Some researchers argue that using a lot of interactivity features could harm interactivity perception [3, 16]. Various studies confirmed that more features mean higher perceptual interactivity score. But large number of studies was conducted ten and more years ago. In the meantime, new technologies changed the face of interactive systems. We want to explore whether measures of interactivity can cope with all those changes. In our case, we manipulated several interactivity features, both traditional (site map, on-line chat room or site search) and new one (online application, sharing content via social media or tagging). Websites in the experiment were differentiated only in terms of interactivity. Results confirmed that all selected measures of perceptual interactivity (Liu, Wu, and Song and Zinkan) determined statistically significant difference between participant who used low interactivity and participants who used high interactivity website. This is important for practice because interactivity can be measured with different models regardless of implemented features.

Sometimes practitioners without intention to favor, put emphasize, for example, on two way interaction or personalization. In this way, some dimension could be neglected. Interactivity is multidimensional, and all dimensions need equal attention. As we said, several measures of interactivity we use in our research could assess interactivity very well, but the question remains whether they are good enough to assess every dimension (for example perceived communication, perceived control or perceived responsiveness). In our study, we analyzed whether different values of various interactivity dimensions estimated for high and low interactivity websites are statistically significant. Our study found that almost all models and their subsequent dimensions are good predictors of interactivity. Liu model dimensions, namely active control and two-way communication were statistically significant between low and high interactivity websites. Mean values for those two dimensions, as we expected, were higher for high interactivity website. But for synchronicity dimension, mean value was lower. All Wu model dimensions values were higher for high interactivity website. Differences between dimension values for high interactivity website and low interactivity website were statistically significant. And for Song and Zinkan model, all dimension values for high and low interactivity website were statistically significant, and with higher mean values for high interactivity website.

Our research has several limitations. First, it is relatively small sample size (n=99). Further, researh could use larger samples. Second limitation is the stimulus. All interactivity features were implemented on one website. This could have impact on the complexity of browsing and searching for relevant topics. Future research could include diferent web sites presented with features, for example (low, midle, and high interactivity). Another way of thinking coud be diferent websites in terms of different interactivity dimensions. Future research could try to identify a linkage between interactivity level and the effects of interactivity.

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