Impact of Different Questionnaire Design Characteristics on Survey Response Rates: Evidence from Croatian Business Web Survey

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Abstract

This paper aims to determinte whether or not certain questionnaire designs could lead to higher response rates compared to other questionnaire designs. To this end, the data from conducted business web survey on a sample of Croatian enterprises was used. In the survey nine different questionnaire designs were randomly distributed across the sample of enterprises. The difference between the questionnaire designs can be found in the number of questions that have been shown to respondents per questionnaire screen and in the kind of provided pictures. The conducted analyses have shown that, when all enterprises together are observed, questionnaire designs in which all questions were shown immediately to the respondents with "negative" pictures included and where questionnaire is divided into logical groups of questions with "positive" pictures, the highest response rates in the future business web surveys could be achieved. Thereby, the recommendation of questionnaire designs for enterprises stratified according to their size, legal form, main activity and location of their headquarters are also provided.

INTRODUCTION

In most cases, under a web survey it is understood a survey where respondents interact with the survey through their Internet browser either on their personal computer, tablet, smartphone or other similar device

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with an access to Internet (Dillman, Smyth, Christian, 2014). If a list-based sampling frame is available, sampling process can be done similarly as in the traditional survey by using sampling frame. However, sometimes the list-based sampling frames are not available and in such a case different approaches can be used as intercept surveys, pre-recruited panel surveys, entertainment polls, surveys using "harvested" e-mail lists, unrestricted self-selected surveys and volunteer (opt-in) panels (see Fricker, 2008).

The response rates of all surveys modes, including web surveys, are reporting to a decline (Carley-Baxter et al., 2009). Low response rates could lead to different problems of which the problem of bias is the most important one (Rindfuss et al., 2015). However, it has to be kept in mind that in survey research the response representativeness is more important than the response rate. But, if response rate carries representativeness, which is the case of most of web surveys, the response rate is important (Cook, Heath, Thompson, 2000). Additionally, response rate is especially important in web surveys because it has been shown by Lozar Manfreda et al. (2008) that, on average, web surveys show an 11% lower response rate compared to other survey modes. The same has been emphasized by Nulty (2008) inby comparison paper based and web surveys. Consequently, web surveys with extremely low response rates, surveys with response rates below 3%, are not rare now (Petchenik, Watermolen, 2011; Dumičić, Bregar, Žmuk, 2014).

Web surveys invitations to participate in a web survey are usually sent by e-mails. In order to increase response rates, in some cases, advance letters can be sent. Furthermore, the design of web surveys invitations may have an impact on response rate. Kaplowitz et al. (2011) have shown that different design elements of web survey invitations, like invitation mode, subject line, location of hyperlink, length of the invitation text, and survey time/effort estimate, show a significant impact on response rates. Furthermore, reminder intervals may also significantly affect the response rates (Lemon, 2007).

In order to increase response rates, respondents may be offered certain incentives which could be prepaid and promised, and they can be given in monetary and in non-monetary forms like gifts, products and similar (Bosnjak, Tuten, 2003). It has been shown that incentives, in general, have a significant positive impact on response rates but data quality problem with ethical consideration in line with the question of cost-effectiveness of incentives increases (Cobanoglu, Cobanoglu, 2003; Göritz, 2006, Singer, Ye, 2013; Cole, Sarraf, Wang, 2015).

The response rates could be impacted by different factors, among which it is worth to mention the lack of potential respondents' interest, excessive survey length and poor survey design, and the lack of interest (Dillman, Smyth, Christian, 2014). There are many theories that can be used to motivate potential respondents: cognitive dissonance theory (Festinger, 1957), reasoned action theory (Ajzen, Fishbein, 1980), adult-to-adult communication style (Comley, 2006), influence theory (Cialdini, 1984), leverage-saliency theory (Groves, Singer, Corning, 2000), cost-benefit theory (Singer, 2011), gamification theory (Lai, Bristol, Link, 2012). Some of these theories have also a direct impact on the questionnaire design. In order to avoid problems with survey length, poor survey design and technical difficulties, Monroe and Adams (2012) recommended that a pilot web survey should be conducted.

In order to improve further response rates, additional attention should be given to questionnaire design. When web surveys are observed, a decision whether to use scrolling or paging design should be made (Couper, 2008). Each of these two questionnaire designs have some advantages and disadvantages. Vehovar, Lozar Manfreda and Batagelj (2000), Forsman and Varedian (2002), Peytchev et al. (2006), and Mavletova and Couper (2014) have found that there is no statistically significant difference in response rates between those two questionnaire designs. However, Topoel, Das and Van Soest (2009) have shown that response rates decrease with an increase of the number of items appearing on a single screen. Still, it is not precisely defined how many questions per questionnaire screen should be given in order to achieve higher response rates (Schonlau, Fricker, Elliott, 2002; FluidSurveys, 2014).

Following the increase of Internet connection speed (Belson, 2017), the question of whether to includeg visual and interactive enhancements to questionnaires appears. Images or pictures can provide additional

information and they can be used as questions, supplements or as incidentals (Couper, 2008). By smart use of pictures, a respondent can understand the questions easily and correctly (Couper, Tourangeau, Kenyon, 2004). However, pictures could be a source of bias if they are not carefully selected (Couper, Conrad, Tourangeau, 2007). Couper, Tourangeau and Kenyon (2004) did not found any evidence that pictures increase respondents' motivation to complete surveys. In other words, according to Couper, Tourangeau and Kenyon (2004) there is no significant impact of pictures on response rates in web surveys. Ganassali (2008) used simple "illustrations" in her survey and came up with the conclusion that the illustrations did not have an impact on the quality of the collected data. On the other hand, Deutskens et al. (2004) have shown that the visual presentation of the questionnaire had a significantly lower response rate than the textual presentation of the questionnaire. Kivu (2010) concluded that pictures have negative impact on dropouts in short questionnaires but positive in long ones.

The impact of using scrolling or paging design, or the impact of the number of questions per questionnaire screen, and the impact of pictures on responses rates is being inspected in general web surveys. However, this research is neglected when business web surveys are observed. Enterprises play a different role in society and have different characteristics as respondents than other individual respondents. Therefore, the impact of the number of questions per questionnaire screen and that of pictures on response rates could be different in business web surveys comparing to the impacts in general web surveys. The main effects of the number of questions per questionnaire screen and of pictures on response rates in business web surveys have already been investigated (Žmuk, 2017, 2018) but the common or interaction effect of these two questionnaire design elements has not been inspected yet. To this end, the main research aim of the paper is to found out which combination of these two questionnaire design elements, the number of questions per questionnaire screen shown to respondents and the kind of presented pictures, should result in the highest response rate in a business web survey. The research hypothesis claims that the simplest questionnaire design should lead to the highest response rate. In the observed case it is reffered to such questionnaire design where all questions, without pictures, are presented at once to respondents.

The paper is organized as follows. After introduction including brief literature review and the explanation of the main aim of the paper, in the first section the methodology used in the paper is desribed. In the first section the main emphasize is given to presenting survey approach to obtain necessary data for the analysis. In the second section results of conducted analyses are shown. In its first part the relationship between different questionnaire designs regards to the number of responses is observed, when different number of questions shown per questionnaire screen and different kind of pictures are included in the questionnaires. In the second part of the analysis section results from conducted log-linear analysis are shown. In the final section of the paper, the results of conducted analysis are discussed and included into the context of business web surveys. The final section provides conclusion.

1 METHODOLOGY APPROACH AND SURVEY RESPONSE RESULTS

In the paper, data from the business web survey conducted on a sample of Croatian enterprises are used. The topic of the web survey was the position of statistical methods in Croatian enterprises and their attitude towards statistical methods usefulness in their business. The web survey started on October 4, 2016 when the invitation e-mails for survey participation have been sent to active Croatian enterprises that, according to their legal form, are joint stock enterprises, limited liability enterprises or simple limited liability enterprises. The enterprise is assumed to be active if it had sent obligatory financial statements, which are related to business transactions conducted in 2015, to government institutions. Due to this, only corporations were observed in the survey. Namely, enterprises of other legal forms do not have so strict rules about sending and publishing financial statements. Consequently, for those enterprises it is difficult to detect if they are active and do some business or they exist only on the paper. Furthermore, if an enterprise is active, it is assumed that it will receive the invitation, read it and make a decision

about conducting some action upon the received invitation. This process is very important to observe as a complete one because otherwise the response rates cannot be measured precisely enough. In order to determine response rate, only the enterprises that completed questionnaire will be taken into account.

The BizNet database was used as sampling frame (Croatian Chamber of Economy, 2017). The BizNet database includes directory of Croatian enterprises and is created and maintained by the Croatian Chamber of Economy. Identically, the BizNet database can be observed as an administrative source of data. Consequently, the data from the BizNet database are considered to be relevant, up-to-date and precise. According to the BizNet database, on the survey starting date there were 102 474 active corporations in Croatia. However, it turned out that not all corporations did provide their e-mail address. It seems that those corporations just do not use e-mail in their business because of different reasons (Just Add Content, 2017). Thus, 64 619 corporations or 63.06% of active corporations have been excluded from the survey because they could not receive the survey participation invitation letter which was sent by e-mail.

The survey participation invitation letter was sent to 37 855 corporations by e-mail. In the invitation letters unique hyperlinks for each corporation were provided. In that way, it has been followed by the information which of nine developed questionnaire versions have been fully completed. In all nine questionnaire versions the wording of questions was exactly the same. The first question in the questionnaire was a filter question to make distinction between corporations that use and that do not use statistical methods. To make sure that respondents provide the correct answer, a brief explanation of what it is understood under the use of statistical methods is given. After the filter question, corporations using statistical methods received 14 specific questions, whereas corporations not using statistical methods obtained four specific questions. At the end of questionnaire, five demographic questions and one optional question about respondents' suggestions were provided to both kinds of corporations. All questions in the questionnaire, except for the last one, were set to be obligatory. The different number of questions resulted in different survey time-limits needed to complete the questionnaire. In order to reduce the impact of different questionnaire lengths on response rate almost all questions were closed ones. Furthermore, in both cases questionnaire length could be considered as short one. Because of that the effect of different questionnaire lengths can be considered as negligible and it will not be analysed in more detail in the paper.

Whereas the question texts were the same, the questionnaire design was different in the nine developed questionnaire versions. The difference between the questionnaire versions can be found in a different number of questions that are shown to the respondent per questionnaire screen and in a different kind of pictures that are displayed to the respondent. Three levels of number of questions per questionnaire screen were introduced. At the first level only one question per questionnaire screen was presented to the respondent. In that case the respondent should answer the question presented in order to make progress in the survey and advance to next question. The second level is defined as a logical group of questions. In this case questions were grouped according to the topic. Enterprises using statistical methods had five groups of questions altogether whereas enterprises not using statistical methods had three groups of questions. The number of questions in the defined groups ranged from one (in case of filter question) to six questions. At the third level all questions were shown to the respondents immediately. It has to be emphasized that in the questionnaire design skip function was added. In other words, enterprises that use statistical methods were not able to see questions which were mentioned to be answered by enterprises that do not use statistical methods and vice versa.

Three different situations considering pictures in the questionnaire also were also created. In the first case, questionnaire did not include any picture. However, in other cases some pictures have been added to the questionnaire. In the second case, "positive" pictures and in the third case "negative" pictures were placed in the questionnaire. The difference between these two kinds of pictures subsists in what they suggest. For example, the question where the respondents were asked about the impact of statistical

methods used in their business on average change of business results a bar chart with added arrow of change was placed. On the "positive" picture the bars are at each following period higher whereas added arrow emphasized the upward trend. On the other hand, on the "negative" picture the bars are at each following period lower whereas added arrow emphasized the downward trend. The questionnaire is short and because of that only few pictures were added to it. To the enterprises that use statistical methods five figures had been shown whereas enterprises that do not use statistical methods only two figures had been presented. It seemed that the number of pictures added to the questionnaire was very low. However, it should be taken into account that the number of questions in the questionnaire is 21, for enterprises that use statistical methods, and 11, for enterprises that do not use statistical methods. Furthermore, the pictures have been carefully chosen and placed next to the questions making a harmonious whole. The option to put a picture next to each question was excluded because the respondents could open the questionnaire in their smartphones and many pictures could cause some technical troubles to the respondents (especially at the questionnaire design where all questions are shown at one time).

Three levels of number of questions per questionnaire screen and three picture cases led to overall nine different questionnaire versions. The intention was that enterprises should be randomly associated to the different questionnaire versions. However, in order to have equally distributed enterprises across all nine questionnaire versions, systematic sampling was applied. In the process of systematic sampling, questionnaire versions have been randomly ordered and associated to enterprises that were alphabetically ordered. The process of systematic sampling was conducted by taking into account some characteristics of the enterprises like legal form (joint stock, limited liability, simple limited liability), size (small, medium, large) and main activity (industrial, trade, service, other). On that way, the number of contacted enterprises should be nearly the same at the overall level but also at each stratum level.

As mentioned earlier, the paper is focused on corporations, which Croatian law recognizes in a legal form of joint stock, limited liability and simple limited liability enterprises (Narodne novine, 2011). The stratification of enterprises by their size on small, medium and large enterprises was made according to the Accounting Act (Narodne novine, 2015). The National Classification of Economic Activities (Narodne novine, 2007) recognizes 21 different areas of enterprises activities. However, that seems to be a very ample and too detailed classification. Consequently, the number of main activities was reduced to only four by merging the original areas of enterprises' activities.

In the paper additional stratification of enterprises will be introduced. In this stratification enterprises are observed according to the location of their headquarters in Croatia. The stratification will be made according to the Nomenclature of territorial units for statistics (Eurostat, 2015). According to the Nomenclature of territorial units for statistics, at the second level of classification Croatia has been divided into Adriatic Croatia and Continental Croatia. It has to be emphasized that enterprises have not been associated to different questionnaire versions according to this stratification. Consequently, the difference in the number of contacted enterprises between the nine questionnaire versions will be more obvious here than at other characteristics of enterprises. In other words, approximately the same number of small enterprises will get each of the nine questionnaire versions. The same applies to medium, large, joint stock, limited liability, simple limited liability, industrial, trade, service and other enterprises. However, when enterprises from Adriatic Croatia or Continental Croatia are to be observed, all nine questionnaire versions will not be so equally distributed across the enterprises as it will be at previously mentioned categories. This problem will be solved later in analysis by using the weighting approach. In the weighting approach the number of contacted enterprises across all questionnaire versions will be equalized to the highest number of contacted enterprises at the observed strata level. The important thing is that this correction will impact on the number of enterprises that completed the questionnaire as well.

During the survey period two reminders were sent. The first survey reminder was sent on November 8, 2016 whereas the second reminder was sent on December 6, 2016. The survey period of collecting data

officially ended on January 1, 2017. The analysis has shown that, from 37 855 contacted enterprises, 780 completed the questionnaires. The resulting Response Rate 1 or ratio of completed questionnaires and contacted enterprises (American Association for Public Opinion Research, 2016) is 2.06%. In Table 1 the number of contacted enterprises, the number of completed questionnaires and resulting Response Rates 1 for all enterprises according to the questionnaire versions are shown.

Table 1 Survey response results according to number of questions shown per questionnaire screen and according to kind of pictures included in the questionnaire, all enterprises

Number of questions shown	Category	Pictures			Total
		Without	Negative	Positive	
One question per screen	Contacted enterprises	4 207	4 209	4 208	12 624
	Response Rate 1 (in %)	2.38	2.09	2.38	2.28
Group of questions	Contacted enterprises	4 206	4 204	4 206	12 616
	Response Rate 1 (in %)	1.71	1.50	2.07	1.76
All questions	Contacted enterprises	4 206	4 204	4 205	12 615
	Response Rate 1 (in %)	2.28	2.43	1.71	2.14
Total	Contacted enterprises	12 619	12 617	12 619	37 855
	Response Rate 1 (in %)	2.12	2.01	2.05	2.06

Source: Own survey

According to Table 1 the highest Response Rate 1, of 2.43%, was achieved by enterprises that received the questionnaire version where all questions were immediately shown and where negative pictures were presented to the respondents. The Response Rate 1 is observed because this measure takes into account only completed questionnaires. On that way, the effect of different questionnaire designs on the response count is the most appropriately observed.

Table 2 Survey response results according to number of questions shown per questionnaire screen and according to kind of pictures included in the questionnaire, enterprises observed according to their size

Number of questions shown	Category	Pictures			Total
		Without	Negative	Positive	
Small enterprises					
One question per screen	Contacted enterprises	4 044	4 046	4 044	12 134
	Response Rate 1 (in %)	2.37	2.17	2.40	2.32
Group of questions	Contacted enterprises	4 042	4 041	4 043	12 126
	Response Rate 1 (in %)	1.76	1.48	2.05	1.76
All questions	Contacted enterprises	4 042	4 041	4 043	12 126
	Response Rate 1 (in %)	2.20	2.38	1.68	2.09
Total	Contacted enterprises	12 128	12 128	12 130	36 386
	Response Rate 1 (in %)	2.11	2.01	2.04	2.06

Source: Own survey

Table 2 Survey response results according to number of questions shown per questionnaire screen and according to kind of pictures included in the questionnaire, enterprises observed according to their size					
					(continuation)
Number of questions shown	**Category**	**Pictures**			**Total**
		Without	**Negative**	**Positive**	
Medium enterprises					
One question per screen	Contacted enterprises	126	126	126	378
	Response Rate 1 (in %)	3.17	0.00	0.79	1.32
Group of questions	Contacted enterprises	127	125	126	378
	Response Rate 1 (in %)	0.79	2.40	3.17	2.12
All questions	Contacted enterprises	126	126	126	378
	Response Rate 1 (in %)	2.38	3.97	2.38	2.91
Total	Contacted enterprises	379	377	378	1134
	Response Rate 1 (in %)	2.11	2.12	2.12	2.12
Large enterprises					
One question per screen	Contacted enterprises	37	37	38	112
	Response Rate 1 (in %)	0.00	0.00	5.26	1.79
Group of questions	Contacted enterprises	37	38	37	112
	Response Rate 1 (in %)	0.00	0.00	0.00	0.00
All questions	Contacted enterprises	38	37	36	111
	Response Rate 1 (in %)	10.53	2.70	2.78	5.41
Total	Contacted enterprises	112	112	111	335
	Response Rate 1 (in %)	3.57	0.89	2.70	2.39

Source: Own survey

In Table 2 the numbers of contacted enterprises, the numbers of completed questionnaires and the values of Response Rates 1 of enterprises stratified by their size and for different questionnaire versions are shown. Since far more small enterprises than medium or large ones can be identified in the population, it is natural that the number of completed questionnaires in small enterprises is far above the numbers of completed questionnaires achieved at medium and at large enterprises. Despite very low number of completed questionnaires, large enterprises showed the highest overall Response Rate 1 (2.39%) whereas small enterprises the lowest one (2.06%). It has to be emphasized that response of large enterprises would be higher if they would not have some restrictive attitude to the participation in such research. Namely, large enterprises often have business decision not to participate in surveys because they do not want to share their business secrets. That could be applied to small enterprises but it is not as obvious as in larger enterprises where business secretes are of greater value.

In small enterprises the highest response rate was achieved at enterprises that received questionnaire where one question per questionnaire screen and positive pictures were shown. In medium-size enterprises the highest response rate was achieved in enterprises that received questionnaire where all questions were shown at once and negative pictures were included. The questionnaire version with all questions shown at once and no pictures achieved the highest response rate in large enterprises. Thus it is obvious that the questionnaire version which would results in the highest response rate is different between enterprises of different size.

Table 3 Survey response results according to number of questions shown per questionnaire screen and according to kind of pictures included in the questionnaire, enterprises observed according to their legal form

| Number of questions shown | Category | Pictures | | | Total |
		Without	Negative	Positive	
Joint stock enterprises					
One question per screen	Contacted enterprises	80	81	80	241
	Response Rate 1 (in %)	5.00	1.23	3.75	3.32
Group of questions	Contacted enterprises	81	80	81	242
	Response Rate 1 (in %)	0.00	2.50	3.70	2.07
All questions	Contacted enterprises	80	79	79	238
	Response Rate 1 (in %)	1.25	1.27	1.27	1.26
Total	Contacted enterprises	241	240	240	721
	Response Rate 1 (in %)	2.07	1.67	2.92	2.22
Limited liability enterprises					
One question per screen	Contacted enterprises	3 961	3 961	3 962	11 884
	Response Rate 1 (in %)	2.27	2.17	2.32	2.26
Group of questions	Contacted enterprises	3 959	3 960	3 959	11 878
	Response Rate 1 (in %)	1.74	1.41	1.94	1.70
All questions	Contacted enterprises	3 959	3 959	3 960	11 878
	Response Rate 1 (in %)	2.20	2.40	1.77	2.12
Total	Contacted enterprises	11 879	11 880	11 881	35 640
	Response Rate 1 (in %)	2.07	1.99	2.01	2.03
Simple limited liability enterprises					
One question per screen	Contacted enterprises	166	167	166	499
	Response Rate 1 (in %)	3.61	0.60	3.01	2.40
Group of questions	Contacted enterprises	166	164	166	496
	Response Rate 1 (in %)	1.81	3.05	4.22	3.02
All questions	Contacted enterprises	167	166	166	499
	Response Rate 1 (in %)	4.79	3.61	0.60	3.01
Total	Contacted enterprises	499	497	498	1 494
	Response Rate 1 (in %)	3.41	2.41	2.61	2.81

Source: Own survey

According to the results from Table 3, the highest overall response rate was achieved in simple limited liability enterprises (2.81%) and the lowest one in limited liability enterprises (2.03%). The joint stock enterprises reached response rate of 2.22%. In joint stock enterprises the highest response rate was achieved in enterprises that received questionnaire without pictures and with one question per questionnaire screen shown whereas in limited liability enterprises the highest response rate was achieved in enterprises that received questionnaire where all questions were shown at once and negative pictures were included. The questionnaire version with all questions shown at once and no pictures achieved the highest response rate in simple limited liability enterprises.

Table 4 Survey response results according to number of questions shown per questionnaire screen and according to kind of pictures included in the questionnaire, enterprises observed according to their main activity

| Number of questions shown | Category | Pictures | | | Total |
		Without	Negative	Positive	
Industrial enterprises					
One question per screen	Contacted enterprises	1 254	1 252	1 252	3 758
	Response Rate 1 (in %)	2.07	2.16	1.84	2.02
Group of questions	Contacted enterprises	1 254	1 250	1 251	3 755
	Response Rate 1 (in %)	1.67	1.68	1.84	1.73
All questions	Contacted enterprises	1 254	1 251	1 251	3 756
	Response Rate 1 (in %)	1.52	2.56	1.76	1.94
Total	Contacted enterprises	3 762	3 753	3 754	11 269
	Response Rate 1 (in %)	1.75	2.13	1.81	1.90
Trade enterprises					
One question per screen	Contacted enterprises	1 067	1 068	1 065	3 200
	Response Rate 1 (in %)	1.69	2.25	1.88	1.94
Group of questions	Contacted enterprises	1 066	1 067	1 065	3 198
	Response Rate 1 (in %)	1.31	0.94	1.88	1.38
All questions	Contacted enterprises	1 064	1 066	1 066	3 196
	Response Rate 1 (in %)	2.07	1.78	1.13	1.66
Total	Contacted enterprises	3 197	3 201	3 196	9 594
	Response Rate 1 (in %)	1.69	1.66	1.63	1.66
Service enterprises					
One question per screen	Contacted enterprises	1 753	1 755	1 758	5 266
	Response Rate 1 (in %)	2.85	1.94	2.96	2.58
Group of questions	Contacted enterprises	1 752	1 753	1 755	5 260
	Response Rate 1 (in %)	2.00	1.71	2.45	2.05
All questions	Contacted enterprises	1 754	1 754	1 756	5 264
	Response Rate 1 (in %)	2.79	2.68	2.11	2.53
Total	Contacted enterprises	5 259	5 262	5 269	15 790
	Response Rate 1 (in %)	2.55	2.11	2.51	2.39
Other enterprises					
One question per screen	Contacted enterprises	133	134	133	400
	Response Rate 1 (in %)	4.51	2.24	3.76	3.50
Group of questions	Contacted enterprises	134	134	135	403
	Response Rate 1 (in %)	1.49	1.49	0.74	1.24
All questions	Contacted enterprises	134	133	132	399
	Response Rate 1 (in %)	4.48	3.01	0.76	2.76
Total	Contacted enterprises	401	401	400	1 202
	Response Rate 1 (in %)	3.49	2.24	1.75	2.50

Source: Own survey

The results from Table 4 show that service enterprises had the most completed questionnaires whereas the highest Response Rate 1 was achieved by other enterprises. The highest response rates are achieved when trade, service and other enterprises are observed and when one question per questionnaire screen is shown to the respondents. However, the trade enterprises show the highest response rate when questionnaire had negative pictures, service enterprises when positive pictures were included in the questionnaire whereas other enterprises had the highest response rate when no pictures had been included in the questionnaire. Industrial enterprises had the highest response rate when all questions were shown at once and when negative pictures were included.

Table 5 Survey response results according to number of questions shown per questionnaire screen and according to kind of pictures included in the questionnaire, enterprises observed according to the location of their headquarters

Number of questions shown	Category	Pictures			Total
		Without	Negative	Positive	
Adriatic Croatia					
One question per screen	Contacted enterprises	1 577	1 586	1 592	4 755
	Response Rate 1 (in %)	2.47	2.02	2.07	2.19
Group of questions	Contacted enterprises	1 618	1 557	1 632	4 807
	Response Rate 1 (in %)	1.79	1.48	1.96	1.75
All questions	Contacted enterprises	1 609	1 642	1 592	4 843
	Response Rate 1 (in %)	1.80	1.89	1.44	1.71
Total	Contacted enterprises	4 804	4 785	4 816	14 405
	Response Rate 1 (in %)	2.02	1.80	1.83	1.88
Continental Croatia					
One question per screen	Contacted enterprises	2 630	2 623	2 616	7 869
	Response Rate 1 (in %)	2.32	2.13	2.56	2.34
Group of questions	Contacted enterprises	2 588	2 647	2 574	7 809
	Response Rate 1 (in %)	1.66	1.51	2.14	1.77
All questions	Contacted enterprises	2 597	2 562	2 613	7 772
	Response Rate 1 (in %)	2.58	2.77	1.88	2.41
Total	Contacted enterprises	7 815	7 832	7 803	23 450
	Response Rate 1 (in %)	2.19	2.13	2.19	2.17

Source: Own survey

In Table 5 survey response results for enterprises according to the location of their headquarters are presented. It has been shown that enterprises from Continental Croatia have higher number of completed questionnaires and higher overall Response Rate 1 than enterprises from Adriatic Croatia. The enterprises from Adriatic Croatia achieved the highest response rate at questionnaires without pictures and where one question per questionnaire screen is shown. On the other hand, the enterprises with the headquarters in Continental Croatia reached the highest response rate at questionnaire version that includes negative pictures and where all questions are shown at once to the respondents.

The results given in Tables 1–5 show that there is no unique favourite questionnaire version that would result in the highest response rate in all observed stratifications of enterprises. Due to the fact that a sample of Croatian enterprises is observed, the inferential statistical approach is going to be used to detect one or more questionnaire designs which result in significant higher response than the other

questionnaire designs. In the first step it is going to be investigated if there is a relationship between the number of questions shown per questionnaire screen and the kind of pictures which are (not) included in the questionnaire. In order to inspect this relationship Pearson's chi-square tests will be performed at overall level and at each strata sublevel. In the following step the impact of different questionnaire designs on the number of completed questionnaire is going to be quantified by using log-linear analysis. The log-linear analyses will be conducted on original numbers of completed questionnaires but also on corrected numbers of completed questionnaires where different number of contacted enterprises is going to be taken into account.

2 ANALYSIS OF NUMBERS OF QUESTIONS AND FIGURES IMPACT ON RESPONSE RATES
2.1 Determining Relationship between Numbers of Questions and Figures
The response data, given as the number of completed questionnaires, from contingency tables presented in Tables 1–5 are used in conducting Pearson's chi-square tests. The Pearson's chi-square test is used to test the relationship between two categorical variables. In the observed case the relationship between the number of questions shown per questionnaire screen and the kind of pictures included in the questionnaire is inspected. In Table 6 the results of conducted Pearson's chi-square tests are given.

Table 6 Pearson's chi-square tests and Cramer's V measure results, in the analysis used responses are measured as the numbers of completed questionnaires

Observation level of enterprises	Pearson's chi-square test			Cramer's V test statistic
	Test statistic	df	p-value	
All	10.249	4	0.036	0.081
Size				
Small	9.070	4	0.059	0.078
Legal form				
Limited liability	7.319	4	0.120	0.071
Main activity				
Industrial	2.587	4	0.634	0.078
Trade	7.347	4	0.119	0.152
Service	6.083	4	0.194	0.090
NUTS-2 region				
Adriatic Croatia	2.911	4	0.576	0.073
Continental Croatia	8.066	4	0.089	0.089

Source: Own survey

According to the results from Table 6, when all enterprises are observed together Pearson's chi-square test results lead to rejection of the null hypothesis at significance level of 5%. Thereby, the confidence that those variables are in some way related, considering the numbers of completed questionnaires, is gained. However, Cramer's V statistic of only 0.081 suggests that this association is very weak (Cramer, 1999).

If enterprises are observed according to one of their characteristic, the conclusion is opposite to the conclusion which has been brought when all enterprises are observed. For example, if only small enterprises are observed, at significance level of 5%, the null hypothesis that variables the number of questions shown per questionnaire screen and the kind of pictures included in the questionnaire are independent cannot be rejected. It has to be emphasized that at certain categories of enterprises the assumption of Pearson's chi-square test was not fulfilled and they were omitted from Table 6. The problem arose because there were some cells in contingency tables with expected values less than five (Cochran, 1952; Bolboaca et al., 2011).

2.2 Measuring Impact of Numbers of Questions and Figures on Response Rates

In the previous chapter the presence of relationship between the number of questions shown per questionnaire screen and the kind of pictures included in the questionnaire was tested. In this chapter the interaction effect size of these two variables on responses will be observed. In order to find out which combination of the observed values result in the highest number of completed questionnaires or responses, hierarchical log-linear analysis will be applied.

Log-linear analysis is a statistical technique used to examine the relationship between categorical variables (Howell, 2009). Because hierarchical log-linear analysis is used, the main effects and the interaction effects are included in the model (Howell, 2009). In order to reduce the impact of expected frequencies lower than five, the value of 0.5 has been added to all observed cells (Field, 2005). Furthermore, for each formed log-linear model it was inspected if the interaction effect was statistically significant by using backward elimination approach with significance level of 0.05. However, no matter whether the interaction effect appears to be or not to be statistically significant, the interaction effect size will be observed (George, Mallery, 2016). The interaction effect will be observed for all enterprises in total and at each strata level. In Table 7 log-linear model parameter estimates of the interaction effect are provided.

Table 7 Log-linear model parameter estimates of the interaction effect sizes of variables number of questions shown per questionnaire screen and kind of pictures included in the questionnaire, all enterprises

Number of questions shown	Pictures		
	Without	Negative	Positive
One question per screen	0.009	−0.052	0.043
Group of questions	−0.051	−0.118	**0.169**
All questions	0.042	**0.170**	−0.212

Source: Own survey

According to Table 7 the highest interaction effect sizes on the response rates are present in cases when all questions were shown immediately to the respondents with negative pictures included (effect = +0.170) and when questionnaire is divided into logical groups of questions with positive pictures (effect = +0.169). It is interesting to see that the lowest interaction effect size is present in questionnaires with all questions immediately shown but with included positive pictures (effect = −0.212). The backward elimination analysis has shown that in case when all enterprises are observed together the interaction effect is statistically significant at 5% significance level (p-value = 0.036).

Table 8 Log-linear model parameter estimates of the interaction effect sizes of variables number of questions shown per questionnaire screen and kind of pictures included in the questionnaire, enterprises observed according to their size

Size	Number of questions shown	Pictures		
		Without	Negative	Positive
Small	One question per screen	−0.006	−0.027	0.033
	Group of questions	−0.033	−0.135	**0.168**
	All questions	0.039	**0.162**	−0.201
Medium	One question per screen	**0.999**	−0.748	−0.251
	Group of questions	−0.899	0.398	0.501
	All questions	−0.100	0.350	−0.250
Large	One question per screen	−0.602	−0.065	0.667
	Group of questions	−0.236	0.301	−0.065
	All questions	**0.838**	−0.236	−0.602

Source: Own survey

According to Table 8 results, the highest impacts on response rates in small enterprises have the same questionnaire versions as at overall enterprises level. However, when medium enterprises are observed the highest interaction effect size on response rates has such questionnaire version in which only one question per questionnaire screen without pictures is shown to respondents (effect = +0.999) whereas the highest interaction effect size at large enterprises is shown in case when all questions are shown immediately to the respondents but also without pictures (effect = +0.838). However, the interaction effects in small (p-value = 0.058), medium (p-value = 0.070) and at large (p-value = 0.269) enterprises seemed not to be statistically significant at 5% significance level.

Table 9 Log-linear model parameter estimates of the interaction effect sizes of variables number of questions shown per questionnaire screen and kind of pictures included in the questionnaire, enterprises observed according to their legal form

Legal form	Number of questions shown	Pictures		
		Without	Negative	Positive
Joint stock	One question per screen	**0.695**	−0.940	0.245
	Group of questions	−0.574	0.499	0.075
	All questions	−0.121	0.441	−0.320
Limited liability	One question per screen	−0.020	0.005	0.015
	Group of questions	−0.010	−0.147	**0.157**
	All questions	0.030	**0.142**	−0.172
Simple limited liability	One question per screen	0.275	−0.674	0.399
	Group of questions	−0.763	0.206	**0.557**
	All questions	0.488	0.468	−0.956

Source: Own survey

In case of limited liability enterprises, results from Table 9 show that the highest impacts on response rates are present at the same questionnaire versions as at overall enterprises level and in small enterprises. On the other hand, joint stock enterprises show the highest interaction effect size at questionnaire version where just one question per screen is shown and where no pictures are included (effect = +0.695) whereas simple limited liability enterprises, similar as limited liability enterprises, have the highest interaction effect size at questionnaires where questions are given in logical groups and where positive pictures are provided (effect = +0.557). According to conducted backward elimination analysis the interaction effect is not statistically significant at significance level of 5% in joint stock enterprises (p-value = 0.250) and in limited liability enterprises (p-value = 0.117) but the interaction effect is statistically significant in simple limited liability enterprises (p-value = 0.022).

Table 10 Log-linear model parameter estimates of the interaction effect sizes of variables number of questions shown per questionnaire screen and kind of pictures included in the questionnaire, enterprises observed according to their main activity

Main activity	Number of questions shown	Pictures		
		Without	Negative	Positive
Industrial	One question per screen	0.101	0.044	−0.145
	Group of questions	−0.045	−0.139	**0.184**
	All questions	−0.056	0.095	−0.039
Trade	One question per screen	−0.164	−0.044	0.208
	Group of questions	0.179	−0.305	0.126
	All questions	−0.015	**0.349**	−0.334

Table 10 Log-linear model parameter estimates of the interaction effect sizes of variables number of questions shown per questionnaire screen and kind of pictures included in the questionnaire, enterprises observed according to their main activity   (continuation)

Main activity	Number of questions shown	Pictures		
		Without	Negative	Positive
Service	One question per screen	0.046	−0.085	0.039
	Group of questions	−0.143	−0.045	**0.188**
	All questions	0.097	0.130	−0.227
Other	One question per screen	−0.086	−0.178	0.264
	Group of questions	−0.376	0.151	0.225
	All questions	**0.462**	0.027	−0.489

Source: Own survey

The results from Table 10 reveal that the highest interaction effect sizes in industrial (effect = +0.184) and at service (effect = +0.188) enterprises is present in case of questionnaire with logical questions groups with positive pictures. In case of trade enterprises, the highest interaction effect size is present at questionnaires with all questions shown at once with negative pictures (effect = +0.349). Similar to trade enterprise, in other enterprises the highest interaction effect is also present at questionnaire where all questions are shown at once to respondents but without pictures (effect = 0.462). Unfortunately, in industrial (p-value = 0.630), trade (p-value = 0.115), service (p-value = 0.188) and at other (p-value = 0.563) enterprises the interaction effect seems not to be statistically significant at significance level of 5%.

Table 11 Log-linear model parameter estimates of the interaction effect sizes of variables number of questions shown per questionnaire screen and kind of pictures included in the questionnaire, enterprises observed according to the location of their headquarters

NUTS-2 region	Number of questions shown	Pictures		
		Without	Negative	Positive
Adriatic Croatia	One question per screen	0.047	−0.029	−0.018
	Group of questions	−0.029	−0.137	**0.166**
	All questions	−0.018	**0.166**	−0.148
Continental Croatia	One question per screen	−0.011	−0.065	0.076
	Group of questions	−0.063	−0.104	**0.167**
	All questions	0.074	**0.169**	−0.243

Source: Own survey

According to Table 11, the highest interaction effect sizes at enterprises that have their headquarters in Adriatic and in Continental Croatia is achieved at questionnaires with logical group of questions and with positive pictures and at questionnaires where all questions are presented to respondents at once along with negative pictures. However, the backward elimination analysis has shown that in enterprises from Adriatic (p-value = 0.578) and from Continental Croatia (p-value = 0.085) the interaction effect is not statistically significant at significance level of 5%.

Except from original numbers of completed questionnaires, the log-linear analyses were conducted by taking into account different number of contacted enterprises. In Table 12 only the questionnaire versions with the highest interaction effects were emphasized.

Table 12 Questionnaire versions with the highest interaction effects size and interaction effects significance tests results, selection based on log-linear model parameter estimates of the interaction effect sizes of variables number of questions shown per questionnaire screen and kind of pictures included in the questionnaire where different number of contacted enterprises is taken into account

Observation level of enterprises	Questionnaire version	Effect size	Interaction effect significance test		
			Chi-square test statistic	df	p-value
All	Group of questions, positive pictures	+0.169	10.316	4	0.035
	All questions, negative pictures	+0.169			
Size					
Small	Group of questions, positive pictures	+0.168	9.149	4	0.057
	All questions, negative pictures	+0.162			
Medium	One question per screen, without pictures	+1.003	8.752	4	0.068
Large	All questions, without pictures	+0.831	5.100	4	0.277
Legal form					
Joint stock	One question per screen, without pictures	+0.702	5.450	4	0.244
Limited liability	Group of questions, positive pictures	+0.157	7.391	4	0.117
	All questions, negative pictures	+0.142			
Simple limited liability	Group of questions, positive pictures	+0.558	11.548	4	0.021
Main activity					
Industrial	Group of questions, positive pictures	+0.184	2.585	4	0.629
Trade	All questions, negative pictures	+0.349	7.476	4	0.113
Service	Group of questions, positive pictures	+0.188	6.160	4	0.188
Other	All questions, without pictures	+0.464	3.008	4	0.557
NUTS-2 region					
Adriatic Croatia	Group of questions, positive pictures	+0.146	2.361	4	0.670
	All questions, negative pictures	+0.151			
Continental Croatia	Group of questions, positive pictures	+0.180	9.170	4	0.057
	All questions, negative pictures	+0.179			

Source: Own survey

If there are questionnaire versions with the highest interaction effects when the different number of contacted enterprises is not taken into account (Tables 7–11) and when it is (Table 12), it can be concluded that there are no differences in selected questionnaire versions. There are some differences in the interaction effect sizes but the differences can be considered as very small. In Table 12 interaction effects significance test results are also provided. The test results lead to the same conclusions about the interaction effect significances as in cases when the different number of contacted enterprises is not taken into account.

DISCUSSION AND CONCLUSION

The aim of the paper is to investigate which combination of questionnaire design characteristics would lead to the highest response rates in web business surveys. As questionnaire design characteristics the number of questions shown per questionnaire screen and kind of pictures included in the questionnaire are observed. Furthermore, here the combinations or interactions of these two characteristics were observed solely The main effects of the number of questions shown per questionnaire screen and kind of pictures included in the questionnaire on response rates were observed in Žmuk (2017, 2018).

In the first step, the relationship between the number of questions shown per questionnaire screen and the kind of pictures included in the questionnaire were inspected. If all enterprises in the sample are observed, it can be concluded that the relationship is statistically significant, at significance level of 5%, or, in other words, that some questionnaire versions with different questionnaire design characteristics can lead to considerably higher response rates than the other questionnaire versions. On that way, the presence of interaction effect was confirmed at overall enterprises level.

The presence of the relationship between the number of questions shown per questionnaire screen and the kind of pictures included in the questionnaire were inspected on some enterprises' sublevels. In order to do such analysis enterprises were stratified according to their size, legal form, main activity and location of their headquarters. Each of the defined stratification level was observed separately. Unfortunately, the stratification of enterprises leads to such enterprises split which resulted in too low enterprises number in certain strata. Consequently, the prerequisites of conducted Pearson's chi-square tests were not fulfilled completely. Because of that the test results should be taken with some precaution into account. However, even if that problem is neglected, the following problem appears. Namely, at significance level of 5%, only in simple limited liability enterprises statistically significant relationship between the number of questions shown per questionnaire screen and the kind of pictures included in the questionnaire was found. If the significance level is increased to 10%, the statistically significant relationship is found in small and medium enterprises as well.

Despite those devastating results on strata levels, in the second step the interaction effect sizes of variables number of questions shown per questionnaire screen and kind of pictures included in the questionnaire were measured by using log-linear model approach. The log-linear analysis results have shown that, when all enterprises are observed, questionnaires where questions are logically grouped with positive pictures and questionnaires where all questions with negative pictures are at once are shown to the respondents have the highest interaction effect size. Accordingly, these two questionnaire versions should result in the highest response rates at all enterprises level. Moreover, the backward elimination analysis has shown that the interaction effect is statistically significant at significance level of 5%.

If interaction effect sizes on different enterprises strata level are observed, different questionnaire versions are pointed out as the ones with the highest interaction effect size. However, in most cases the questionnaire version with logically grouped questions and positive pictures turned out to have the highest interaction effect size. Because of that, when no certain kind of enterprises is in the researchers' focus, it can be concluded that this questionnaire version should be used in web business surveys in order to achieve the highest response rate. If certain kind of enterprises is in the focus of researchers, it is recommended to check Table 12 for selecting the best questionnaire version for the observed kind of enterprises. Unfortunately, the backward elimination analyses have shown that the interaction effect in not statistically significant at significance level of 5% in majority of observed strata. Despite the fact that the given results of research, selected questionnaire versions and calculated interaction effect sizes, can be used as a good starting point for further research on this topic but also the results can be used in the following business web surveys conduction.

Response rates of web surveys tend to be very low with a trend of being even lower. Because of that something has to be done to increase response rates. There are different possibilities. In the paper

the interaction effect of the number of questions shown per questionnaire screen to respondents and the kind of included pictures on response rate in business web surveys. In order to inspect the interaction effect overall nine questionnaire designs or questionnaire versions have been created. Some of questionnaire versions have not shown statistically significant interaction effect on response rates whereas some did. Despite that, the questionnaire versions with the highest interaction effects have been emphasized. On that way, at overall and at all observed strata levels of enterprises allocated are questionnaire versions that should result in the highest response rate among other defined questionnaire designs.

However, there are some drawbacks of the research. The questionnaire may also be too short to measure good effect of pictures on response rates. Also, the number of pictures introduced in the questionnaire could be seen as small. In the further research that should be improved. Furthermore, at some strata level the number of enterprises that participated in the survey is really low and in some cases it was equal to zero. More efforts should be invested to receive appropriate and needed number of responses from such enterprises for analyses purposes.

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