The Effect of Using Web Technologies to Gather Educational Research Data, and Impact on Research Results

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Abstract: *There are different ways of administering a questionnaire, such as with a pen and paper, face-to-face, over the phone, or via a computer, for example. Some researchers may select a specific mode or use more than one mode within a single study to generate additional responses. Moreover, it is widely agreed that the way in which a questionnaire is administered affects output data (Grandjean et al., 2009, Koponen et al., 2011, Kelly et al., 2008). This paper aims to show the ways in which results from web-based approaches—which are notably based on using web technology—and the paper-based mode of distributing a questionnaire may be dissimilar. Furthermore, this paper shows the way in which the researcher has dealt with the gap in the results.*
Keywords: Expert power, Referent power, Self-confidence, Reliance, Connectedness

1. Introduction

Through the use of web technology systems, data gathering has become widely used owing to the fact of it being considered more manageable and inexpensive compared with a paper- based mode (Fleming, 2009). A web-based questionnaire is a very common method for the collection of statistical data. Researchers commonly utilise the approach with the aim of covering a wide range of samples. In this study computing students have been sampled via web computer and paper methods. The authors were interested on possible effect of input mode of for students who are familiar with computing surveys and completing questionnaires electronically compared to paper based. This paper has considered an educational study case wherein the mode of gathering data should be taken into consideration. This paper is part of an educational study entitled, 'The impact of using web technology as source of knowledge on student-lecturer relationship'. In this study and based on the desire of the participants, two modes produced to fill in the questionnaire, online-based and paper-based mode. Both have the same content. The questionnaire was an anonymous as to avoid any impact the researcher may have on participants as he and participants have a teacher-student relationship. So in both modes the participants were able to express their views without influence.

2. Method

2.1. *Instrument*

The questionnaire has 45 close-ended 7-point likert scale questions rating from 'strongly disagree' (1) to 'strongly agree' (7), and 5 open-ended questions, which are excluded in this research paper. The questions are divided into six groups where each group does not link to others. Each one measures the specific impact of web technology on the student-lecturer relationship: Group 1: Expert power which measures how students' knowledge gained from using websites has impacted on the relationship with their lecturer as a knowledgeable person; Group 2: Referent power which measures how students' knowledge gained from using websites has impacted on the relationship with their lecturer as he/she consider a role model; Group 3: Self-confidence which measure how students' knowledge gained from using websites has impacted on their self-confidence; Group 4: Reliance which measure how students' knowledge gained from using websites has impacted on their reliance on their lectures as they consider the main source of knowledge in classroom; Group 5 Connectedness which measures how student communication with their lecturers using web technologies has impacted in the relationship with them; and Group 6: Not included in this paper.

2.2. Process

In total, 1,361 students responded to the questionnaire. 453 students completed the online version, and 908 students completed the paper version. The data from both versions were merged into one database with a note to distinguish each mode. All data were processed and analysed through the use of SPSS/PASW software with focus on the Mean value difference between the results of the two modes.

3. Results

By using PASW, data split into two groups, online participants and paper participants. Then a T-test performed to examine difference between paper and on-line administration as a function in the 6 categories. The table below shows the results between the two modes is, on average, insignificant (0.359). Markedly, if the Means difference is greater than 1.0, this means that the result has changed from one category to another in the 7-point likert scale. For example, the result might change from 'agree' to 'strongly agree'. Figure 1 and Table 1 show a slight gap in the self-confidence group (0.546), whilst another in the reliance group, is to some extent, with 0.98, which is almost 1.0. In Figure 1, it can be seen that the minimum value between Question 41 and Question 43 is located in a different category on the scale.

Table 1 T-test results of comparing online to paper mode

	Online					*Paper*				
				95% Confidence Interval of the Difference					95% Confidence Interval of the Difference	
	t	df	Mean Difference	Lower	Upper	t	df	Mean Difference	Lower	Upper
Q11	64.087	452	**4.596**	4.46	4.74	82.624	899	**4.564**	4.46	4.67
Q12	55.926	452	**4.373**	4.22	4.53	77.982	900	**4.388**	4.28	4.50
Q13	80.390	452	**5.530**	5.39	5.66	86.452	899	**4.867**	4.76	4.98
Q14	71.425	452	**4.943**	4.81	5.08	87.059	900	**4.630**	4.53	4.73
Q15	83.449	452	**5.634**	5.50	5.77	98.894	900	**5.263**	5.16	5.37
Q16	70.749	452	**5.113**	4.97	5.25	92.278	899	**4.940**	4.83	5.05
Q17	51.060	452	**4.318**	4.15	4.48	66.873	900	**4.117**	4.00	4.24
Q19	69.317	452	**4.949**	4.81	5.09	82.040	867	**4.941**	4.82	5.06
Q20	57.035	452	**4.656**	4.50	4.82	79.058	867	**4.673**	4.56	4.79
Q21	54.302	452	**4.479**	4.32	4.64	78.090	867	**4.734**	4.61	4.85
Q22	52.895	452	**3.976**	3.83	4.12	76.568	864	**4.124**	4.02	4.23
Q23	49.998	452	**4.355**	4.18	4.53	73.334	867	**4.538**	4.42	4.66
Q24	56.523	452	**4.159**	4.01	4.30	75.842	867	**4.252**	4.14	4.36
Q26	97.399	452	**5.976**	5.86	6.10	88.513	869	**5.323**	5.20	5.44
Q27	93.390	452	**5.801**	5.68	5.92	94.808	869	**5.191**	5.08	5.30
Q28	98.064	452	**5.536**	5.43	5.65	110.082	869	**5.228**	5.13	5.32
Q29	101.865	452	**5.890**	5.78	6.00	100.215	870	**5.265**	5.16	5.37
Q30	99.361	452	**5.748**	5.63	5.86	101.438	870	**5.281**	5.18	5.38
Q31	83.631	452	**5.625**	5.49	5.76	85.999	870	**5.015**	4.90	5.13
Q33	68.625	452	**5.386**	5.23	5.54	62.574	844	**4.414**	4.28	4.55
Q35	50.837	452	**3.914**	3.76	4.07	66.141	841	**4.095**	3.97	4.22
Q36	49.651	452	**4.203**	4.04	4.37	69.771	844	**4.425**	4.30	4.55
Q37	67.256	452	**5.026**	4.88	5.17	88.901	844	**5.096**	4.98	5.21
Q38	51.743	452	**4.146**	3.99	4.30	76.285	844	**4.440**	4.33	4.55
Q39	51.203	451	**4.237**	4.07	4.40	75.438	842	**4.550**	4.43	4.67
Q40	70.144	452	**5.230**	5.08	5.38	92.075	842	**5.121**	5.01	5.23
Q41	32.467	452	**2.585**	2.43	2.74	50.998	844	**3.347**	3.22	3.48
Q42	29.714	452	**2.336**	2.18	2.49	49.404	844	**3.169**	3.04	3.30

Q43	40.158	452	**3.587**	3.41	3.76	66.616	842	**4.172**	4.05	4.29
Q44	39.420	452	**3.506**	3.33	3.68	64.856	844	**4.124**	4.00	4.25
Q45	42.776	452	**3.728**	3.557	3.900	63.950	844	**4.178**	4.05	4.31

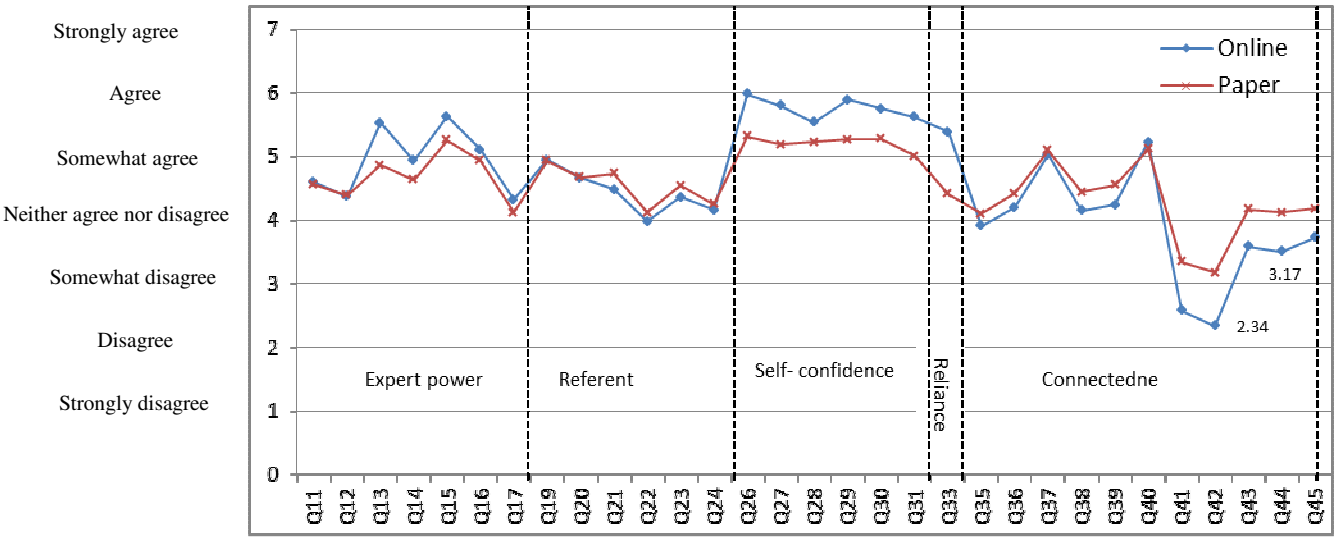

Figure 1 The gap between online and paper mode of the questionnaire

4. Proposed Solution

In the two figures, the blue trend represents the online questionnaire results, and the red one represents results from the paper-based version. In order to bridge the gap between the two trends, the average of both Means has been calculated to create a new trend that represents the overall results, as shown in Figure 2. AVG = ((Means of online result + Means of paper result) / 2) shows a green trend, as can be seen in Figure 2. This trend represents the adjustment of data between online- and paper-based methods; however, the job of the AVG trend is needed more so in the self-confidence group, reliance group, and part of the connectedness groups, since the two results were slightly spaced in these parts.

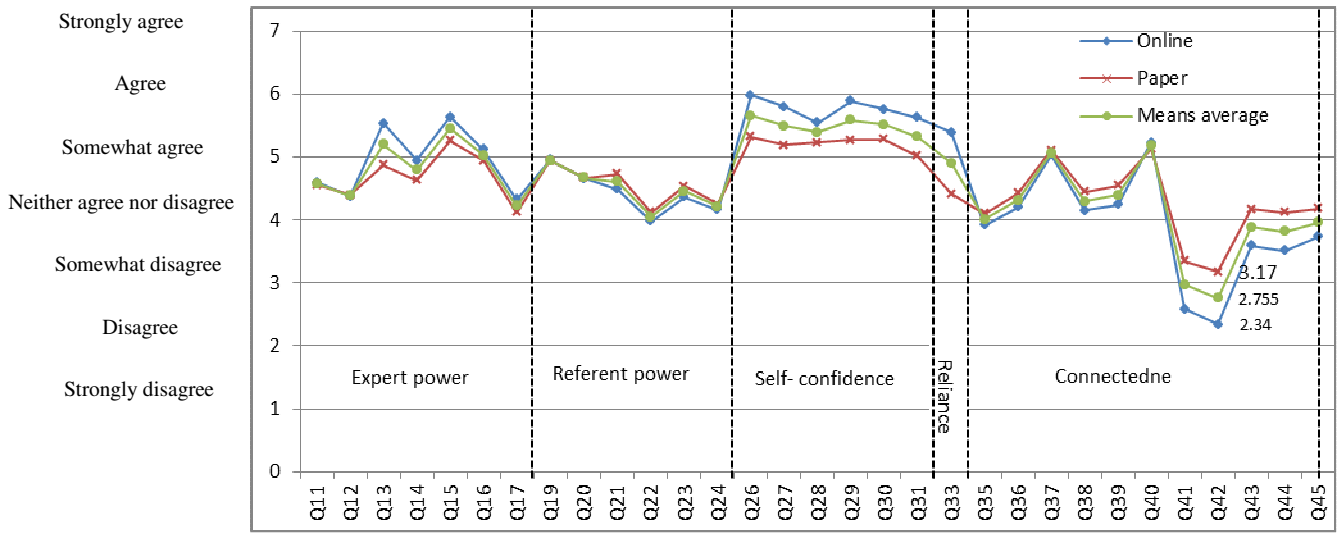

Figure 2 Bridging the gap between online and paper results

5. Discussion/Conclusion

In this research, by reviewing the questions in which the gap has appeared, there are no indications to justify such a gap. This is a common issue when administering more than one mode of questionnaire. The reason behind this issue remains unclear (Lee, 2009, Kelly et al., 2008); however, the aim of this paper was to show the way in which results might be different between web-based and paper-based modes of distributing a questionnaire, and to further highlight the way in which the gap has been bridged. In this case study, the gap between the two modes of questionnaire was bridgeable since it was not wide.

There are three possible points to be drawn from this study. First, it is important to conduct a comparison between the results from the two questionnaire modes, and accordingly make an adjustment. Second, small differences between the two results would satisfy and reassure the researcher as they suggest that both sources of data fairly accurately represent participants' opinions. If the gap is significant, the research should then reinvestigate which mode of questionnaire reflects participants' opinions, and thus eliminate the other.

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