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An Expansion of Survey Data Collection Methods to the Virtual Worlds by Means of VDCI

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An Expansion of Survey Data Collection Methods to the Virtual Worlds by Means of VDCI

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Abstract

Changes in communication technology have allowed for the expansion of data collection modes in survey research. The proliferation of the computer has allowed the creation of web and computer assisted auto-interview data collection modes. Virtual worlds are a new application of computer technology that once again expands the data collection modes by VASI (Virtual Assisted Self Interviewing). The Virtual Data Collection Interface (VDCI) developed at Indiana University in collaboration with the German Socio-Economic Panel Study (SOEP) allows survey researchers access to the population of virtual worlds in fully immersive Heads-up Display (HUD)-based survey instruments. This expansion needs careful consideration for its applicability to the researcher's question but offers a high level of data integrity and expanded survey availability and automation. Current open questions of the VASI method are an optimal sampling frame and sampling procedures within e. g. a virtual world like Second Life (SL). Further multi-modal studies are proposed to aid in evaluating the VDCI and placing it in context of other data collection modes.

Keywords: Interviewing Mode, PAPI, CAPI, CASI, VASI, VDCI, Second Life
JEL Classification: C81, C88, C93, Y8

1 Introduction

The research question, sampling frame, and instrument design all come before the data collection process. Data collection can be seen as a conduit that the survey process "flow[s] through" (Groves et al., 2004, p. 137). The mode of data collection is the specific method and/or technologies used in the data collection process. Traditional modes, used in survey research, include face-to-face interview, mail surveys, and telephone interviews. The face-to-face interview is when an interviewer asks respondent questions and records their answers. Mail surveys are conducted by sending numerous respondents a pen and paper (P&P) survey and asking them to complete the survey and mail it back to the researcher. Telephone survey modes have the survey researcher contact the respondent by telephone (either from a list or using random dialing techniques) to ask them questions and record the respondent's answers. Survey experts Groves et al.[1] caution each of these modes has strengths and weaknesses. With the development of different technologies, new modes of data collection become available to researchers (p. 7). Audiences and traditional survey modes are being effected by societal changes (use of cell phones, mistrust of bulk email) to the point that some survey research theorists suggest that survey researchers can "no longer afford not to consider the communicative properties of new technologies." (Schober & Conrad, 2008, p. 3).

With the proliferation of internet-enabled hardware, software and broadband access, survey researchers have expanded into web-enabled and other advanced technology data collection methods (Groves et al., 2004, p. 139). With each expansion of modes, each mode must be evaluated, tested and its strengths and weaknesses determined. This paper introduces another expansion to current data collection modes - and an expansion to current sampling frames too.

[1] After surveying several graduate level survey methodology syllabi, the Groves et Al book, *Survey Methodology*, was a consistent text used.

2 Plan of the paper

One area of expansion of survey data collection has been the computerized self-administered questionnaire (CSAQ) or more recently known as a computer-assisted self interviewing (CASI) approach. A CSAQ is a "computerized questionnaire that request information electronically from respondents without an interviewer present and where the respondents use their own (or their organizations) personal computer (PC) to respond" (Ramos, Sedivi, & Sweet, 1998, p. 389). This definition applies to CASI as well. Initially text based (text-CASI), multimedia computers have allowed other forms of CASI to develop, Audio-CASI and Video-CASI (Groves et al., 2004, p. 140). An Audio-CASI delivers the questions in audio form the video-CASI uses "graphical stimuli as part of the measurement". Survey method theorist Mick P. Couper suggests this mode may "profoundly change the nature of the survey interview" (Couper, 2008, p. 58).

As with any new data collection mode, an evaluation comparing the new mode to other modes need to be done before the new mode can be used. Groves et al. suggest a series of dimensions by which to examine modes of data collection. 1) Degree of Interviewer Involvement 2) Degree of Interaction with the respondent 3) Degree of Privacy 4) Channels of communication and 5) Technology use (2004, p.141). These dimensions provide a common ground to view and evaluate data collection modes. Also, Couper (2000, p. 490) suggests evaluating web survey data collection modes (and by extension other data collection modes) on the properties of "coverage, non-response and measurement error." Also Aldridge & Levine (2001, pp. 126-134), suggest that there functions of processing of responses that self-contained auto-interviews should contain. These include specialized data entry software specific data file formats and data types, codebook construction, different levels of measurement and response control. Together with Groves et al.'s dimensions, Couper's properties and Aldridge and Levine's functions, an initial evaluation of a data collection mode can begin.

Virtual Assisted Self Interviewing (VASI) expands the CASI mode in the virtual worlds. A special piece of software for this expansion of PAPI (Paper and Pencil Interviewing) to a virtual world, namely "Second Life", has been developed at Indiana University in collabora-

tion with the German Socio-Economic Panel Study (SOEP) (cf. Wagner et al. 2007). We call this piece “Virtual Data Collection Interface (VDCI).

To place the VDCI in context, the status of survey research in virtual worlds (cf. Giles 2007, Miller 2007, Castronova et al. 2007) will first be described. Then the VDCI will be described and discussed with Groves et al.’s dimensions, Couper’s properties and Aldridge and Levine’s functions. In conclusion, a plan for future evaluative steps and research made available by this expansion of data collection modes will be proposed. An important open methodological question is the definition of proper sampling frames in virtual worlds. Of course the “properness” depends on the research question behind of certain survey study.

In the final discussion section an important open question needs still seeks an answered. In SL avatars have no private residences (where they live) which addresses could be used as a sampling basis. So how can a representative sample of SL inhabitants (users at a given point of time?) can be drawn?

3 Current virtual survey technology

The current state of virtual environment surveys is centered in two areas: interactive telephone surveys and web-based surveys. With advanced in telecommunications programming and telephone system customization it is possible to create Interactive Voice Response (IVR) surveys that can capture audio responses (for recording or voice recognition) and dual-tone multi-frequency (DTMF) input (Groves et al., 2004, p. 140). Traditional telephone surveys are being challenged because participants preferred methods of communicating are also changing (Schober & Conrad, 2008, p. 3). Fewer and fewer people have land lines and more and more are adding their names to “do not call” registries.

A web survey is a form of CASI in which “a computer administers the questions on a Web site” (Groves et al., 2004, p. 139). These have expanded to include not only text surveys but also, audio and visual surveys to allow the most technologically broad CASI. As with any

data collection mode web surveys have advantages and disadvantages. Some of the advantages are convenience, rapid data collection, cost effectiveness, ample time to complete, ease of follow-up, confidentiality, security, and reach into specialized populations, complexity and visual aids. Some disadvantages include limited respondent bases, self-selection and lack of interviewer involvement (Rea & Parker, 2005, pp. 11-12). In 2008, Schober & Conrad concluded that web surveys could not just replicate pen and paper surveys but researchers had to take advantage of the "unique properties of web interaction" (p.3).

Virtual worlds may be defined as "a synchronous, persistent network of people, represented as avatars, facilitated by networked computers" (Bell, 2008). More than a mere expansion of the web, a virtual world offers new opportunities for data collection modes. Currently, survey research in virtual worlds is involved in multimodal research. Instead of surveying participants in virtual worlds, researchers have used auxiliary social gathering technologies (such as message boards) and so they simply conducted ordinary web surveys[2]. Also, virtual world research has been conducted in other modes including field-based panel study that also used web surveys (Williams, 2006a). (Williams, 2006b). In these studies, researchers surveyed participants outside of the virtual worlds therefore impacting their sampling frame. The sample frame could be affected by the burden of removing the participant from the virtual world to complete the survey, disengaging from the avatar state, technical difficulties that can result, time delay, and social presence issues. Most virtual worlds do not allow in-world surveys to be created and programmed but some virtual worlds are now allowing the creation of such content.

In the virtual world Second Life (SL), a few survey methods have been attempted. The GMI corporation uses built in dialogs to the SL Viewer program to conduct surveys and have expanded into avatar-administered surveys. These surveys use text based questionnaires, localized to the survey avatar's location, subject to issues with avatar-based surveys such as "atointerviewer's intelligence, believability, trust, pragmatic ground rules, personality and other dimensions of social presence" (Graesser, Jeon, & McDaniel, 2008). Some prominent survey

[2] Griffiths, Davies, & Chappell (2003), Seay, Jerome, Sang Lee, & Kraut (2004), Yee, The Demographics, Motivations and Derived Experiences of Users of Massively-Multiuser Online Graphical Environments, 2006a, Yee (2006b), Yellowlees & Cook (2006), Williams (2006c), and Kemp & Livingstone (2006).

companies in SL, GoVista Marketing LLC and metarl.com, recruit participants for marketing surveys in-world but conduct their surveys out-of world via websites. These surveys break the virtual world immersion and return to the advantages and disadvantages of the web survey data collection mode. Interaction with the respondent is much more difficult outside than within the virtual world itself. For example, a behavioral experiment, including payment of the subjects, is easy to handle within the virtual world, but significantly more difficult to handle if a researcher and respondents (subjects) switch between ordinary web surveys and their virtual world.

Tretiak Media has experimented with creating an in-world survey tool. Tretiak Media used a method known as a Heads-Up Display (HUD). After attempting to create a useful tool in SL, the project was abandoned due to design problems and Tretiak Media has returned to out-of-world web-based surveys[3].

Virtual worlds are providing a fruitful area for marketing survey research, but there has be no strong academic survey data collection done. Chesney et al. (2007) do behavioural experiments in SL. However, the do not draw a representative sample of users of SL but they run conventional lab-experiments (like behavioural economists do since many years) in a "virtual lab" with "subjects" who visited their virtual lab. This is a very interesting further development for behavioural scientists who do want to run experiments in an user-friendly environment, but who stick to the self-selection of their subjects. A device which allows virtual world survey data collection as a survey mode cannot allow self-selection but it must be programmed in a manner which allows doing random sampling.

The VDCI is an attempt to expand Virtual Assisted Self Interviewing (VASI) into a mode that addresses some of the issues of existing virtual survey research while maintaining rigorous quality and control.

[3] From a conversation between the author and ANDREW Mallon, executive director of the Social Research Foundation, that cooperates with Tretiak Media.

4 VASI: VDCI in Second Life

The Virtual Data Collection Interface (VDCI) developed at Indiana University in collaboration with the German Socio-Economic Panel Study (SOEP) allows for fully automated CASI within the world of Second Life, a mode that can be named "VASI" as above. This section describes the architecture of the VDCI, the user experience and explains the VDCI in terms of Groves et al.'s dimensions, Couper's properties and Aldridge and Levine's functions to describe to begin an initial evaluation (Aldridge and Levine 2001, Couper 2000, and Groves et al. 2004).

4.1 VDCI Architecture

The VDCI is designed to expand the mode of survey data collection fully into the realm of virtual worlds (VASI). This is currently only possible in virtual worlds that allow robust user content creation, such as SL. SL allows user to create objects, link them, program them as if they were objects in an object-oriented environment, and communicate with external data stores.

At the moment the VDCI is designed for SL only.

The VDCI is designed as a Heads-up Display (HUD) the user puts on that displays the survey instrument text, audio or graphics and then records the participant's answer. This information is formatted in the HUD object and using Linden Scripting Language (LSL) and PHP scripts sent to a MYSQL database (Figure 1). This database can then export the data in a common format that can be imported into SPSS or other data analysis tool.

The HUD is offered to an avatar by means of a "Survey Kiosk" (Figure 2).

HUDS have been used in aviation (Sterman & Mann, 1995) and the medical field (Block, Yablok, & McDonald, 1995) but are not currently being used in virtual worlds as a data collection technology. SL offers a built in system of Heads-up Design (HUD) development and attachment. HUDS are used in the virtual world to display interactive applications only the user it is attached to can see and interact with. The other users, through their avatars, in the

virtual world cannot see that another avatar is wearing a HUD or that they interacting with it (Figure 3).

The LSL is a proprietary scripting method that allows you to attach scripts to objects or groups of objects in SL. These scripts control event-driven behavior of objects. For instance, a cube can be clicked on and certain words can appear above it. LSL scripts are stored within the objects in SL. The VDCI uses LSL to control a HUD that displays the survey instrument. These scripts display questions and answers, capture input data, avatar information (such as name), and survey progress to completion. The scripts also communicate with PHP scripts external to SL that transfer the data into a MySQL database.

PHP is also an open-source scripting language for the dynamic control of web pages. These scripts are stored outside of SL on a secure web server. The VDCI PHP scripts receive data sent from LSL scripts and format statements to write the information to a MySQL database.

A secure MySQL database is an open-source database that stores data in tables. The VDCI PHP scripts format data in to SQL statements that the MySQL database understands and then stores the data. This data is then able to be exported from the database in several formats including comma delaminated which then can be imported into a data analysis program like SPSS. The development of this interface was one of the major steps forward which VDCI are doing

Each part of the VDCI is scripted to display the appropriate question or response, capture the response chosen, and the current question number. This information is gathered together and using LSL commands sent to the PHP scripts then the database.

One of the benefits of the LSL/PHP/MySQL method is that the data flow is both ways. Based on the input by the participant the survey will be able to not only send information to the database but also retrieve information and dynamically alter the survey the participant sees. Thus, in principle quite complicated questionnaires with difficult skip patterns (as in CAPI) are feasible.

Currently, the VDCI writes all data to the database in numeric values but the presentation of the survey instrument to the respondent can use nominal, ordinal, interval and ratio levels of measurement and be translated back to those levels.

User Experience. A goal of the VDCI is to create an easy to use, fast, immersive experience for the survey participant. The participant's avatar clicks on a survey kiosk and is given the VDCI HUD which appears on their screen. The participant reads any material needed before beginning the survey and then begins answering questions. The participant's avatar name is automatically collected and as long as a particular survey runs it is stored. The VDCI also controls for multiple responses and half-complete responses by allowing only one complete survey per avatar.

After getting an explicit permission by the respondent it is possible to store the name on a permanent base and thus real longitudinal panel surveys are possible. When a respondent answers a question he or she is automatically advanced to the next question. Back and forward buttons can be added if the survey instrument requires it. If the participant has a problem in the middle of a survey and needs to restart the survey the VDCI will know where they left the survey and continue from that point. When the survey is finished, if required, the participant is paid in Linden Dollars (SL's in-world currency) and it is possible to give them other objects which are considered to be assets within SL. Finally, after completing the survey the participant is inhibited from taking the survey again. Once the survey is complete the participant just needs to detach the object with a few clicks.

Surveys can be conducted 24 hours a day from any region in SL. No interviewer interaction needs to take place. It is technically possible to place the survey kiosks anywhere in SL. Legally, the kiosks can be placed in any unrestricted or public area; in private areas, owner permissions may or may not be necessary. Developing a good sampling plan for the territory of SL is still an open question (we come back to this later). Also the survey can be taken simultaneously by large numbers of users.

No one will be able to see the avatar has the VDCI HUD attached or that they are asking questions so anonymity is assured. In order to ensure anonymity after the completion of the survey the avatars names are deleted. However, in order to allow real longitudinal surveys (repeated interviews by means of VDCI) the VDCI can ask respondents for permission to store their avatar names.

4.2 Assessment of VDCI

A data collection is not right for every question asked by researchers. Gaining an understanding of a data collection mode will help a research determine if the mode is correct for the research question and survey instrument they are using. By using criteria from Groves et al., Couper and Aldridge and Levine a more contextual view of the VDCI can be gained. This view will let a researcher determine if the VDCI is the appropriate mode of data collection for their unique instance.

Mode Effects. Viewed through Groves et al.'s data collection dimensions, the VDCI offers the research both familiar and expanded data collection mode options. The VDCI offers a very low degree of interviewer involvement. The interviewer does not need to be logged into SL or knowledgeable of participants taking the survey for the VDCI to be collecting data. The VDCI also allows automatic recruitment of participants at all times and in all areas of SL. If they wish the interviewer can be sent an email or instant message that can be stored, any questions and important data from the participant included. The VDCI has a high level of interaction with the participant. The participant answers the questions directly with only a few pieces of information (such as the time and user name) are collected automatically. In terms of privacy, the VDCI offers near anonymity. A survey can be taken at any time on any computer that can connect to SL. No one in-world would know a participant had the survey HUD attached or that they were answering questions. Currently, only the avatar name of the participant is stored for the duration of a single survey. So anonymity is high after completion of the survey (after the survey agency stop to do interview). This may be beneficial when respondents are answering sensitive questions (Groves et al., 2004, p. 143).

The VDCI offers several channels of communication (text, audio and graphics). Each of these allows the researcher to set their own level of social presence. Since the VDCI is primarily text-based, it may be susceptible to primacy mode effects and when creating surveys with the VDCI this should be considered. In terms of technology used the VASI offers a high level of constraint, providing clean data, but, in its current iteration, does not accept responses to open-ended questions. Also, the technological needs of SL are high (broadband access, high-end graphics card and PC) so the effect of this on the population available needs to be considered. Using Groves et al.'s dimensions the VDCI is possible to begin to see where the VDCI is placed in context of other data collection modes.

Couper defines measurement error as "the deviation of the answers of respondents from their true values on the measure" (p. 475) and states it could be introduced by the respondent or he survey instrument. Proper pre-testing and use of existing survey instrument validation are imperative in any survey and ones that use the VDCI should not be different. Like the previous observations through Groves et al.'s lens.

Aldridge & Levine in a chapter on processing response list functions that certain modes of data collection should include. These functions cover a wide range of modes from low technology to high technology. In terms of specialized data entry software, the VDCI includes several of the functions listed in Aldridge and & Levine. The VDCI has customizable data entry screens and constrained entry fields. The VDCI's two-way communication between the virtual world and database allow for customization of survey instrument during data collection referred to as the routing function. The VDCI can also have bounds-checking consistency test built into it so that data accuracy can be maintained. The VDCI stores the data in commonly used formats and is transactional-based. The database can also easily export data to other tools making it easier for researchers to survey virtual world populations without being in the virtual world on a constant basis. Each time the respondent enters an answer their response is immediately written to the database.

Since the VDCI has a high level of level of constraint it also aids in the data processing functions data checking and cleaning. Together with Groves et al. and Couper, Aldridge and Levine allow the VDCI to be placed in context of other CASI data collection modes.

Coverage and Non-Response. Couper's properties, though directed at web survey data collection modes, are applicable to other forms of data collection modes including the VDCI. Couper warns coverage error is the "the mismatch between the target population and the frame population" (Couper, 2000, p. 467). Couper suggests web surveys, and other data collection modes such as the VDCI, knowledge of population, sample frame and coverage are imperative for minimizing coverage error. Being familiar with the virtual world population will reduce coverage error.

Understanding of virtual populations by a researcher using VDCI would also aid in understanding non-response and how to minimize it. The VDCI mode tries to maximize the availability of the survey by time and placement but there will always be some level of nonresponse that should be taken into consideration. The VDCI also controls for multiple responses and half-complete responses by allowing only one complete survey per avatar.

A still open question is how proper sampling frames can be defined within SL. Most inhabitants of SL do not have a private residence in SL. Those who own private property, especially a private home, do not live there on a permanent basis. Most of the time they are not there, and when they are present, they are more likely to meet people from their own time zone. Correspondingly, they are less likely to meet people from distant time zones. Moreover, people will tend to congregate around their interests.

Then there is the question of how and where the survey kiosks should be placed. In the real world, one uses addresses to form a sampling basis. In SL, some avatars have land, but most do not have a private residence as such from which one could develop a sampling basis analgous to an address-based approach.

The question of how one draws a representative sample of SL “inhabitants”, or users at a given point of time, remains open. Inferring general statistics from the particular distribution of people in SL is not impossible, but represents a challenge for future work.

Even here, though, the unique nature of the VDCI facilitates some answers. VDCI is a robot and does not require the presence of a human-driven avatar to operate. It is therefore possible to place very large numbers of VDCI devices in the streets and public places in SL. In the real world, this would be like overcoming sample-frame issues with very large numbers of interviewers. In the real world, this strategy’s downfall is its high cost. Not so in the virtual world.

Secondly, the time zone issues lead to the suggestion that VDCIs distributed across Second Life should be open for response 24 hours a day. This gives inhabitants (avatars) from all time zones an equal chance to respond.

5 Conclusion

The expansion of data collection modes offer survey researchers different ways to best answer the questions they are asking. The VDCI expands on existing data collection mode technologies allowing researchers a broader range of data collection possibilities.

The VDCI does expand the possibilities available to researchers but, like any data collection mode, must be evaluated in how well it fits the question being asked. Couper’s concerns about coverage, nonresponse and measurement errors are valid and should be addressed with any survey using the VDCI. Studies that compare expanded data collection modes to traditional, tested modes need to continue to ensure the validity of the VDCI and place it in data collection context. This paper begins that process but much work remains.

For applications within SL the single most important question which is still to be addressed is the sampling frame. There are already some reasonable approaches here, however, and future work will no doubt establish the appropriate protocols. Under these protocols, a proper sample can be drawn. Once a sample is drawn longitudinal surveying is – in principle – an easy

task because the name of avatars who were interviewed can be stored. For a second interview and even more interviews avatars can be reached by instant message.

There are plans at Indiana University and the German Socio-Economic Panel Study (SOEP) to use existing P&P as well as CAPI and web surveys with the VDCI to gain results and compare the modes of data collection. Use of the VDCI in multi-modal studies will aid in understanding how it compares other data collection modes. Also, as more virtual worlds allow for user created content and object programming, the VDCI can be transferred from SL in other virtual worlds and applied there.

Finally, virtual worlds are far from static entities and even more expansive data collection opportunities may arise. Further study is needed and other worlds, as always, need further exploration.

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Figure 1 – Architecture diagram of the VASI (VCDI).

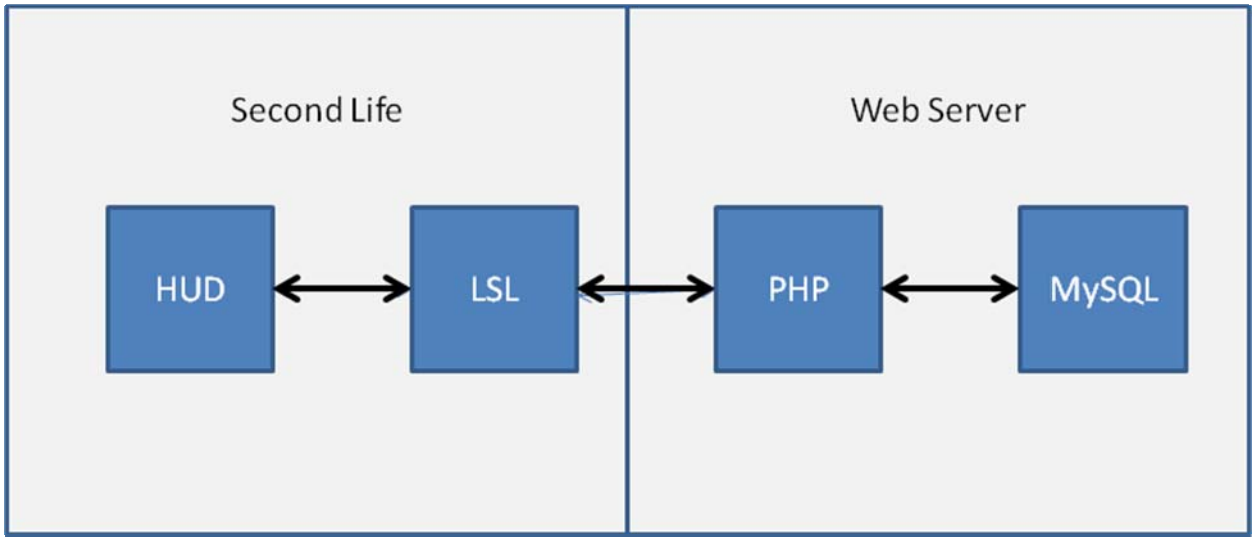

Figure 2 – A “Survey Kiosk”

Figure 3 – An avatar with a HUD attached.