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Virtual Assisted Self Interviewing (VASI): An Expansion of Survey Data Collection Methods to 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 to access the population of virtual worlds with 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 on the VASI method concern the optimal sampling frame and sampling procedures within a virtual world like Second Life (SL). Further multi-modal studies are proposed to evaluate the VDCI and place it in the context of other data collection modes.

Keywords: Interviewing Mode; Paper-and-pencil Interviewing; Computer Assisted Personal Interviewing; Computer Assisted Self Interviewing; Virtual Assisted Self Interviewing; Virtual Data Collection Interface; Second Life

JEL Classification: C81, C88, C93, Y8

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Virtual Assisted Self Interviewing (VASI):

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

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 interviews, mail surveys, and telephone interviews. A face-to-face interview consists of an interviewer asking a respondent questions and recording his or her answers. Mail surveys are conducted by sending numerous respondents a pen-and-paper (PandP) survey and asking them to complete and return the survey. In telephone surveys , the researcher contacts respondents by telephone (selected either from a list or at random) to ask questions and record the respondents’ answers. Survey experts Groves et al. (2004) cautioned that each of these modes has strengths and weaknesses. With the development of different technologies, new modes of data collection have become available to researchers (p. 7). Audiences and traditional survey modes are being affected 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 and 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 assessed for strengths and weaknesses. This paper introduces another expansion of current data collection modes, as well as and an expansion of current sampling frames.

Plan of the Paper

One area of expansion of survey data collection has been the computerized self-administered questionnaire (CSAQ), more recently known as a computer-assisted self interviewing (CASI) approach. A CSAQ is a “computerized questionnaire that requests information electronically from respondents without an interviewer present and where the respondents use their own (or their organization's) personal computer (PC) to respond" (Ramos, Sedivi, and Sweet, 1998, p. 389). This definition applies to CASI as well. Initially text based (text-CASI), multimedia computers have allowed the development of other forms of CASI, audio-CASI and video-CASI (Groves et al., 2004, p. 140). Audio-CASI delivers the questions in audio form, whereas video-CASI uses "graphical stimuli as part of the measurement" (Groves et al., 2004, p. 140). Survey method theorist Mick P. Couper suggested that 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 existing modes must be done before the new mode can be used. Groves et al. (2004) suggested a series of dimensions by which modes of data collection can be evaluated: (a) degree of interviewer involvement, (b) degree of interaction with the respondent, (c) degree of privacy, (d) channels of communication, and (e) technology use (p. 141). Also, Couper (2000) suggested evaluating web survey data collection modes (and, by extension, other data collection modes) on the properties of "coverage, non-response and measurement error" (p. 490). Aldridge and Levine (2001, pp. 126–134) suggested that there are 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, code book construction, different levels of measurement, and response control. 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 world. A special piece of software for this expansion of PAPI (paper-and-pencil interviewing) to a virtual world, namely Second Life (SL), has been developed at Indiana University in collaboration with the German Socio-Economic Panel Study (SOEP; cf. Wagner, Frick, and Schupp, 2007). We call this piece the Virtual Data Collection Interface (VDCI).

To place the VDCI in context, the status of survey research in virtual worlds (Castronova et al., 2007; Giles, 2007; Miller, 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.

In the final discussion section, an important open question is presented. In SL, avatars have no private residences (where they live) with addresses that could be used as a sampling basis. So how can a representative sample of SL inhabitants (users at a given point in time) be drawn?

Current Virtual Survey Technology

The current state of virtual environment surveys is focused in two areas: interactive telephone surveys and web-based surveys. With advances 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 and Conrad, 2008, p. 3). Fewer and fewer people have landlines, 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. Like 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, reach into specialized populations, complexity, and visual aids. Disadvantages include limited respondent bases, self-selection, and lack of interviewer involvement (Rea and Parker, 2005, pp. 11–12). In 2008, Schober and Conrad concluded that web surveys could not just replicate pen and paper surveys; researchers had to take advantage of the "unique properties of web interaction" (p. 3).

A virtual world 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 multi-modal research. Instead of surveying participants in virtual worlds, researchers have used auxiliary social gathering technologies (such as message boards) and simply conduct ordinary web surveys (Griffiths, Davies, and Chappell, 2003; Seay, Jerome, Sang Lee, and Kraut, 2004; Yee, 2006a and 2006b; Yellowlees &and Cook, 2006; Williams, 2006c; Kemp and Livingstone, 2006). Also, vVirtual-world research has been conducted in other modes, including field-based panel studies that also used web surveys (Williams, 2006b, 2006c). In these studies, researchers surveyed participants outside the virtual worlds; a decision which impacts the, 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 delays, 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 within the SL Viewer program to conduct surveys and has expanded into avatar-administered surveys. These surveys use text-based questionnaires, localized to the survey avatar's location, and are subject to issues such as "auto-interviewer's intelligence, believability, trust, pragmatic ground rules, personality and other dimensions of social presence" (Graesser, Jeon, and McDaniel, 2008). Prominent survey companies in SL, such as 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 becomes more complicated when it includes contact inside and outside of the virtual world. For example, a behavioral experiment, including subject payment is easy to handle within the virtual world but increases in complexity if the interactions between the researcher and respondents (subjects) include both ordinary web surveys and the 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 an attempt to create a useful tool in SL, the project was abandoned due to design problems, and Tretiak Media returned to out-of-world web-based surveys (A. Mallon, Personal Communication, Sept 16, 2008).

Virtual worlds are providing a fruitful area for marketing survey research, but there has been no strong academic survey data collection done. Chesney, Chuah, and Hoffmann (2007) do behavioural experiments in SL. They do not draw a representative sample of users of SL, but they run conventional lab experiments (like behavioural economists have for many years) in a “virtual lab” with “subjects” who visit their virtual lab. This is a very interesting development for behavioural scientists who want to run experiments in a user-friendly environment but who prefer the self-selection of subjects. A device that allows virtual world survey data collection as a survey mode cannot allow self-selection, but it must be programmed in a manner that allows 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.

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, addresses 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 begin an initial evaluation (Aldridge and Levine 2001; Couper, 2000; Groves et al., 2004).

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 users 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 another data analysis tool.

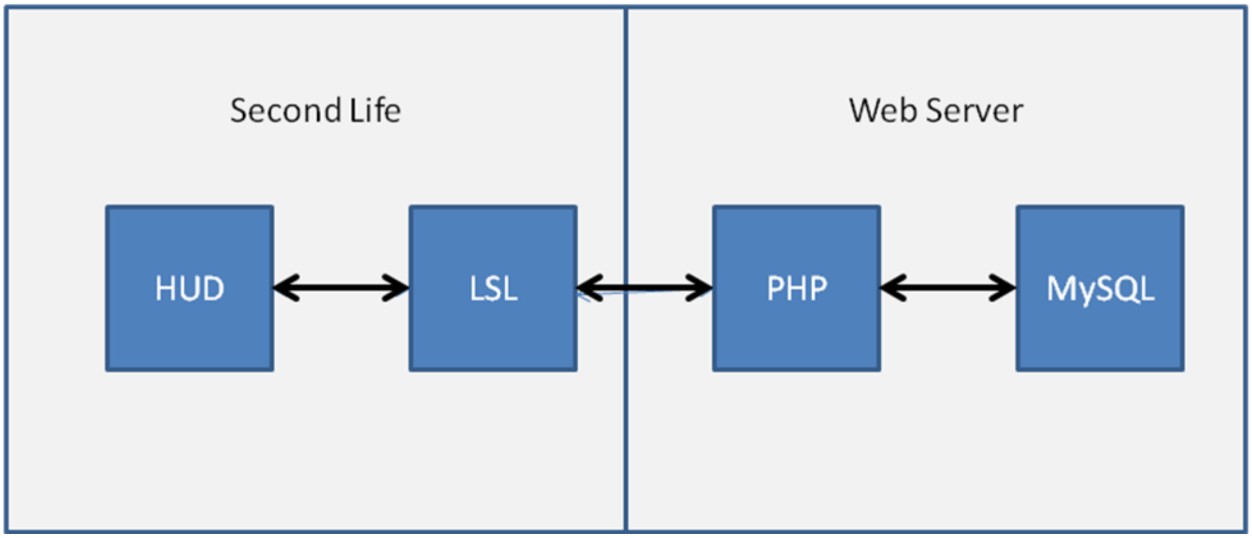

Figure 1. Architecture diagram of the VASI (VCDI).

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

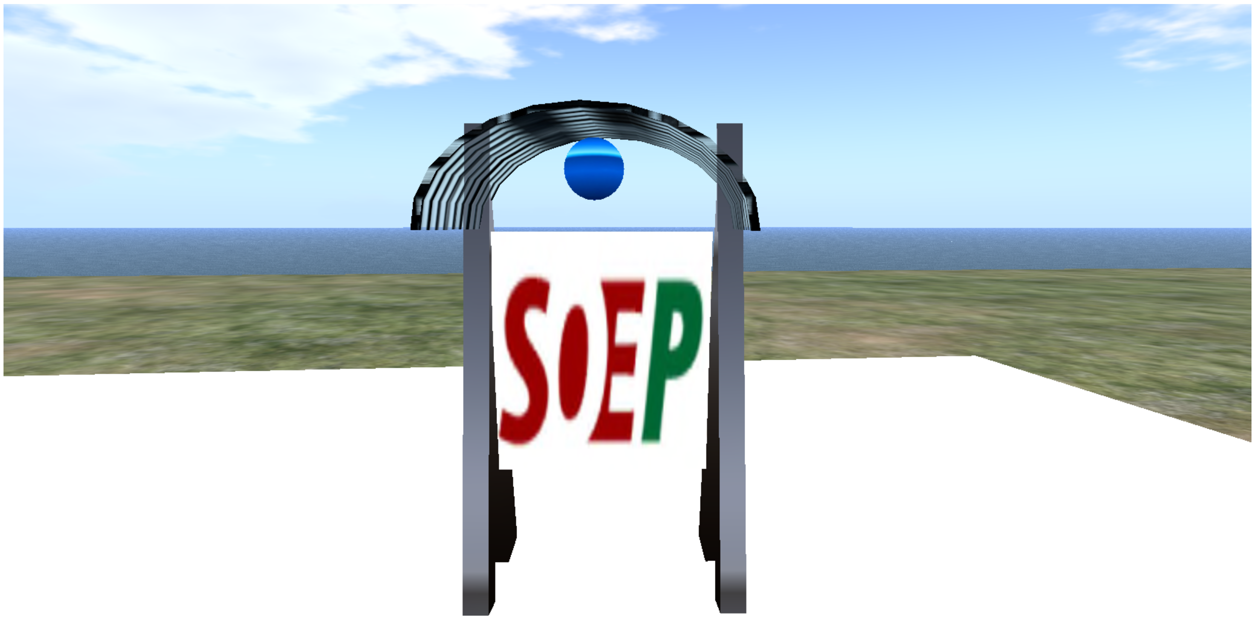

Figure 2. A "survey kiosk."

HUDs have been used in aviation (Sterman and Mann, 1995) and the medical field (Block, Yablok, and McDonald, 1995) but are not currently used or data collection in virtual worlds. 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 to individual users. Other users, through their avatars in the virtual world, cannot see that another avatar is wearing or interacting with a HUD (Figure 3).

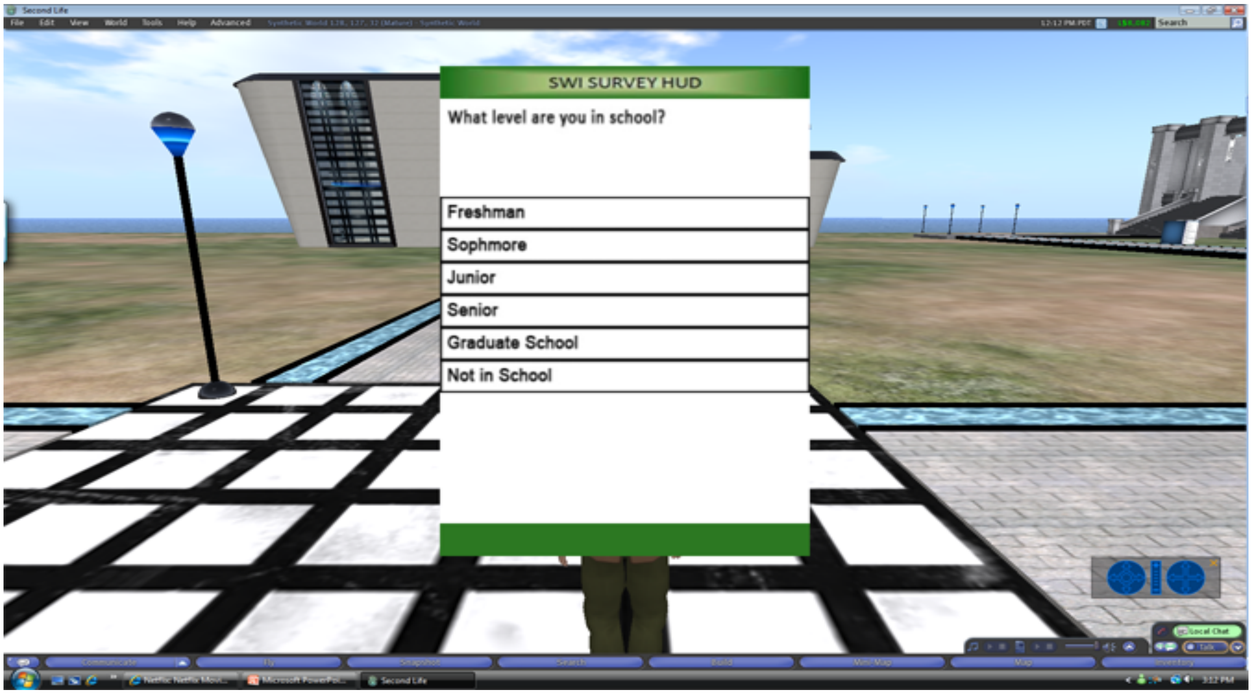

Figure 3. An avatar with a HUD attached.

The LSL is a proprietary scripting method that allows one to attach scripts to objects or groups of objects in SL. These scripts control the 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, collect avatar information (such as name), and track 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 into SQL statements that the MySQL database understands and then stores. These data are then able to be exported from the database in several formats, including comma delimited, which then can be imported into a data analysis program like SPSS. The development of this interface is one of the major steps forward that VDCIs are taking.

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

One of the benefits of the LSL/PHP/MySQL method is that the data flow goes both ways. Based on the input by the participant, the survey is able to not only send information to the database, but also retrieve information and dynamically alter the survey the participant sees. Thus, in principle, 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, immersed 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; 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 needs to pause and restart the survey at a later time, the VDCI will know where the participant 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 him or her other objects that 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 can detach the object with a few clicks.

Surveys can be conducted 24 hours a day from any region in SL. No interviewer interaction is required. 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 will come back to this later). Also, the survey can be taken simultaneously by large numbers of users.

No one will be able to see that avatars have 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.

Assessment of VDCI

A data collection mode may not right for every question or every researcher. Gaining an understanding of a data collection mode will help a researcher determine if the mode is correct for the research question and survey instrument he or she is using. By using criteria from Groves et al., Couper and Aldridge, and Levine, one can gain a more contextual view of the VDCI. This view will let a researcher determine if the VDCI is the appropriate mode of data collection for his or her unique instance.

Mode effects

Viewed through Groves et al.'s data collection dimensions, the VDCI offers the researcher 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 aware 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, interviewers can be sent an email or instant message that can be stored, with 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, and 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. Therefore, anonymity is high after completion of the survey. 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 his or her own level of social presence. As the VDCI is primarily text-based, it may be susceptible to primacy mode effects, and when creating surveys with the VDCI, researchers should consider this. In terms of the technology used, the VASI offers a high level of constraint; it provides 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, a 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, it is possible to begin to see where the VDCI is placed in the context of other data collection modes.

Couper (2000) defined measurement error as "the deviation of the answers of respondents from their true values on the measure" (p. 475) and stated that it could be introduced by the respondent or the survey instrument. Proper pretesting and use of existing survey instrument validation are imperative in any survey; those that use the VDCI should not be different.

Aldridge and Levine (2001) listed 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 allows for customization of the survey instrument during data collection, referred to as the routing function. The VDCI can also have a bounds-checking consistency test built into it to maintain data accuracy. The VDCI stores the data in commonly used formats and is transaction-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, his or her response is immediately written to the database.

As the VDCI has a high level of constraint, it also aids in the data processing functions of data checking and cleaning. Together with Groves et al. (2004) and Couper (2008), Aldridge and Levine (2001) allow the VDCI to be placed in the context of other CASI data collection modes.

Coverage and nonresponse. Couper's properties, though directed at web survey data collection modes, are applicable to other forms of data collection, including the VDCI. Couper (2000) warned that coverage error is the "the mismatch between the target population and the frame population" (p. 467). Couper suggested that web surveys, other data collection modes such as the VDCI, and knowledge of the 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 nonresponse and how to minimize it. We created the VDCI mode to try 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 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 from which one could develop a sampling basis analogous 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 it 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. This is not the case in the virtual world.

Secondly, 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.

Conclusion

The expansion of data collection modes offers 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 terms of 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 names 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 PandP 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 with 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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