

# Internet-mediated research: Challenges and issues

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## ABSTRACT

This article reviews the challenges of, and issues associated with conducting internet-mediated research. The article explores the use of online platforms and in particular social media platforms for research purposes. Additionally the methodological considerations are demonstrated with examples from the author's praxis. The review involves examining two case studies based on the design science methodology and on the Delphi technique. This paper reports on the performance of these methods under the internet-mediated research paradigm and specifically considers the challenge of low response rates. Consequently the primary aim of this article is to report the demographics determinants of experts who participate in internet-mediated studies to identify possible links to response rates and attrition rates. Exploring the relationship between response rates and the demographical data of experts is consequential as this may impact the validity of internet-mediated research.

**Keywords:** online surveys, social media, design science methodology, Delphi technique

**Categories:** • Information systems ~ World Wide Web

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## 1 INTRODUCTION

The internet and social media have radically transformed online communication. Similarly research methodologies are being transformed by the internet and the myriad of social media platforms. It is evident that using these types of platforms influences the research process with respect to data collection, analysis, ethics and sampling. The British Psychological Society (2013) describes the term internet-mediated research as “research involving the remote acquisition of data from or about human participants using the internet and its associated technologies” (p. 3). The internet provides platforms that facilitate research practice—first, there is a wealth of easily accessible data that may be effortlessly collated (Wu, Sun, & Tan, 2013); second, there is a plethora of cheap, user-friendly and highly sophisticated tools available online to collect data and to analyse data (Bhoi & Bhue, 2015) and third, it expedites the sampling process as it provides a diverse pool of participants to access (Hewson, Vogel, & Laurent, 2015). There are however several challenges (i.e. obstacles to overcome)

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and issues (i.e. contentious matters) concerning internet-mediated research. An auxiliary aim of this article is to examine these issues and challenges. This article presents a secondary analysis on two case studies in order to reflect on how internet-mediated research and practice might be enhanced with improved response rates. Consequently the main aim of this article is to examine the challenge of response rates within a specific type of internet-mediated research.

Internet-mediated research offers many advantages over traditional research methods. There is a wealth of information available online such as transaction logs, software use, purchasing behaviour, file uploads and downloads (Kraut et al., 2004). There are also numerous data formats available—textual, photographic, video (Beninger et al., 2014), audio data. Quinton (2013) identified three potential sources for research:

1. data that is already available (discussion forums, tweets, posts, images, and so on)
2. data that may possibly be collected via online platforms in order to address a research question and
3. data from authorship (blogs, self-published works, and so forth).

Research mediated online also offers an opportunity for secondary research analysis (Kara, 2015) given the volumes of data that is available online. Research conducted online is more eco-friendly and economical (Ramsey, Thompson, McKenzie, & Rosenbaum, 2016). Wright (2005) discussed several economic advantages: free data collection and analysis tools like Google Forms; cost savings (savings on data collection as participants capture the data) and time saving (immediate feedback allowing the researcher to conduct a preliminary analysis). Further social media platforms provide new research opportunities to view online behaviours as it occurs in its natural setting and it facilitates access to a group of people who may otherwise be too difficult to reach physically (Moreno, Goni, Moreno, & Diekema, 2013). Additionally using online forums for research saves time as it allows quick access to large numbers of individuals with shared interests (Wright, 2005). However despite the advantages, there are also several challenges that are inherent to internet-mediated research.

A major challenge that plagues internet-mediated research is low response rates (Monroe & Adams, 2012; Pan, Woodside, & Meng, 2014; Sauermann & Roach, 2013; Shao, Wu, Zou, & Chen, 2015; Sinclair, O’Toole, Malawaraarachchi, & Leder, 2012). Manzo and Burke (2012) assert that low response rates threaten the validity of survey results “because non-response might not be random – non-responders in a sample sometimes share similar characteristics” (p. 327). Sinclair et al. (2012) found that the response variances between four modes of surveys (telephone (30.2%), personalised postal survey (10.5%), generic postal survey (7.5%) and the internet survey (4.7% for the personalised approach and 2.2% for the generic approach)) could be due to differing motivations and interest in the survey topic. Mlikotic, Parker, and Rajapakshe (2016) also suggested that it is worth considering a participant’s survey mode preference (web or postal). They found that younger participants and those at a higher education level were more likely to use the website platform questionnaire while variations in ethnic groups were not significant. Khazaal et al. (2014) found that online gamers are more likely to participate in an online survey regarding the game they had proficiency or expertise in. Sinclair et al. (2012) called on researchers to “document and report

on the potential biases in the target and respondent populations and how this may affect the data collected” (p. 138). These studies suggest that exploring the relationship between response rates and the demographical determinants of experts is consequential as it may impact the validity of a study. Demographic factors such as qualifications, career profiles and years of experience were considered as determinants of response rates. Consequently the primary aim of this article is to report on the demographics determinants of experts who participate in iterative internet-mediated studies to identify possible links to response rates and attrition rates. Iterative type studies require repeated participation.

Understanding these demographics provides an important context for nonresponse analysis. However it has been suggested that targeting the appropriate or interested populations may be key to improving response rates (McPeake, Bateson, & O’Neill, 2014). This is a significant factor with respect to studies dependent on expert knowledge which require repeated participation as demonstrated by the case studies examined in this paper. Moreover such studies, which are reliant on expert knowledge, aim to obtain a representative sample of experts in order to overcome sampling bias problems.

The purpose of this paper is to review the general issues and challenges involving iterative internet-mediated research studies specifically with respect to response rates involving experts. The primary aim is to explore a major challenge that besets internet-mediated research i.e. low response rates and its relationship to demographic determinants. Section 2 surveys the general concerns surrounding internet mediated research. Section 3 presents an overview of the techniques used to resolve low response rates. Section 4 explicates the research methodology used. Section 5 presents the case studies. Section 6 provides a discussion of the findings. Section 7 offers a few recommendations that arose from the preceding section. The article concludes in Section 8 with possible future research opportunities.

## 2 RELATED WORK

This section provides a discussion of general issues and challenges of internet-mediated research, and helps to situate the challenges of consent and specifically low response rates. Although many of the problems discussed in this section are also inherent in traditional survey research, some are unique to internet-mediated research. The issues range from validity, security, sampling and credibility to technological. These are all issues that a researcher must be cognisant of. Whereas the specific challenges range from informed consent to a major concern in internet-mediated research viz. low response rates.

### 2.1 Validity-related issues

Internet-mediated research removes interviewer bias (Selm & Jankowski, 2006) as the interviewer is operating remotely, thereby increasing the validity and ensuring that the participants may be more ‘free’ to express themselves. To test whether online research may affect the validity of the research would not be easy, unless one were to employ the traditional methods as well. Whitehead

(2011) compared the results of two groups—one group was mediated on the internet while the other group was facilitated via email. In the aforementioned study several psychological scales were tested. Significant differences were noted in the ‘Fatigue Symptom Inventory’ scale between the online and offline group while the other scales showed no discernible difference. Whitehead (2011) was unable to account for the difference, and indicated that online research may simply not be suitable for all types of research. The online group might have been more open about their psychological state. The anonymity of the internet may furthermore provide access to respondents who would normally feel uncomfortable about sharing their experiences (Selm & Jankowski, 2006). For example, Buchanan and Smith (1999) found that web-based tests appear to provide a better measure of personality traits than conventional methods, noting that participants show “increased levels of honesty and self-revelation when computerised assessments are employed” (p. 139).

Comparable studies by Buchanan, Johnson, and Goldberg (2005) and Davis (1999) did however show that the results with online and offline groups were similar, confirming that validity was not an issue. Davis (1999) reported that the response rate of the online group (54.4%) and the mail group (50.7%) were similar, albeit with a gradual attrition in the online group.

A web-based survey may be more difficult to control, as anyone with access may complete it, thereby skewing the sampling process and consequent results (Selm & Jankowski, 2006). In a study conducted by Konstan, Rosser, Ross, Stanton, and Edwards (2005) one participant sabotaged the survey through repeated submissions (of the 1150 submissions, 119 were from the same participant). They recommend that one should increase the validity of study by using automated and manual validation techniques. Invalid surveys can be detected by means of internet protocol address, email address and biographical detail, completion time, a comparison of start and end times of surveys and payment records. Konstan et al. (2005) managed to identify the suspicious participant by considering the completion times, and comparing the start and end times of the surveys and payment records. Kraut et al. (2004) indicates that online research may require larger samples than is the case with traditional methods to combat this type of problem.

## 2.2 Security issues

In the age of computer viruses and phishing attacks, computer users are frequently warned about clicking on bogus links, consequently most individuals are afraid to open attachments or links. A solution to this problem could be embedding the questionnaire into the email content area. Internet users are bombarded with bogus lotteries and ‘get rich quick’ schemes (Wright, 2005) hence utilising methods that are associated with inauthentic techniques may harm the credibility of the study.

## 2.3 Sampling issues

An individual who has online access is likely to be middle-class, educated and techno-savvy—this might limit generalisation and bias the sample (Ahern, 2005). Sampling bias depends on the study, for example, if it is not based on the general population, then there may be a bias (Hewson, 2008). Self-selection bias may be another issue (Thompson, Surface, Martin, & Sanders, 2003), as Wright (2005) indicates that certain types of people are more likely to complete an online survey. For

example, some participants may receive many invitations to participate in surveys and become desensitised and apathetic, while others may be sceptical. For some individuals there is perhaps an element of curiosity or the lure of receiving immediate feedback may encourage them to participate.

## 2.4 Credibility issues

Participants that load their demographic information incorrectly or do not update their information regularly could skew the credibility of the results. According to Beninger et al. (2014), participants may behave differently online which may also skew the results. They cite issues such as exaggerated viewpoints, impulsivity and inaccurate profiles. However Guillory and Hancock (2012) found that LinkedIn users were less deceptive about aspects such as work experience and responsibilities, instead they were more deceptive about aspects that are difficult to verify such as interests and hobbies. They claim this suggests that the perception that internet based modes are more deceptive than traditional modes is incorrect.

## 2.5 Technological issues

Whitehead (2011) suggests that poor response rates with internet-mediated research could be the result of website presentation, or technical issues such as internet speed or the fear of viruses. Occasionally firewalls can prevent links from being opened (Jacob & Jacob, 2012). This may tarnish the credibility of the researcher as the recipient may believe that the researcher has submitted a potentially harmful link. Some individuals may not have the appropriate software to open attachments (Snyder-Halpern, Thompson, & Schaffer, 2000). Alternatively some individuals may not have the requisite skills (Jacob & Jacob, 2012).

## 2.6 Challenges to informed consent

Obtaining consent in internet-mediated research is complex and difficult to administer in a completely anonymous web survey. With an e-mail survey, the researcher is able to trace the respondents, as he or she initiated the distribution. An alternative approach which involves collecting data via social media platforms, message boards and forums leaves the researcher less able to trace respondents. The challenge lies in obtaining consent while maintaining confidentiality and privacy. There are ethical considerations—the user of the platform needs to be aware that their data is being used for research purposes. As far as social media is concerned, a researcher may use biographical data and demographical data which are already available, without the owner's consent, as the researcher is not directly engaging with the participant (i.e. indirect participation). Direct participation or reactive research (Hewson, 2008) involves individual engagement with the participant and most often demands consent. However, indirect participation, which is non-reactive or opportunistic research, involves indirectly collecting information from a participant's interaction on social media sites and this type of research may or may not require consent. Non-reactive research or opportunistic research is about gathering information that was not originally intended for research purposes (Hewson, 2008; Whitehead, 2007).

Indirect participation is an ethical conundrum with regard to drawing the distinction between public and private information online. For instance, a breach in confidentiality may occur, if direct quotes from a discussion forum are traced back to the originator using a search engine (Beninger et al., 2014). Phillips (2011) indicates it is not clear whether postings on social media sites such as Facebook and Twitter are public or private behaviour and whether the author's consent is therefore required. Phillips (2011) proposes that one might ask the participants to download summaries of their own postings or for the participants to click 'like' on Facebook to allow access to their private information. Kraut et al. (2004) indicate that consent is required in the following instances: where there is direct interaction with the participant, if there is 'identifiable private information', or if there is any risk to the participant. However, the contention remains over data that is publically available online. Alternatively Kraut et al. (2004) indicate that consent is not required if all of the following requirements are met: if the research involves the study of extant data, documents or records; if these sources are publically available; and if the subject cannot be identified. There is a disparity between the views of Phillips (2011) and Kraut et al. (2004). While Kraut et al. (2004) propose that it is acceptable to use information in the public domain for research purposes, provided there is no personally identifiable information, Phillips (2011) indicates that the owner of the information must provide some sort of consent. Beninger et al. (2014) found that the following instances in internet-mediated research require direct consent—quoting a username alongside a post; if the post was not recent; reproduction of photos; quoting sensitive/personal posts; or if the researcher profits from reproducing the post. This is a contentious matter and the ethics boards of universities need to draw a formal conclusion regarding research on social media.

Beninger et al. (2014) found that users of various social media platforms, such as Twitter, Facebook or LinkedIn had varying expectations of privacy for each platform, for example, users of Facebook indicated that consent is required due to its personal nature, while users of LinkedIn and Twitter felt that consent was superfluous as the information was less personal. As the intention of each platform (social vs. professional) is different, the expectations of the users in terms of the privacy of their information are varied.

## 2.7 The challenge of rising nonresponse rates

There are five major factors that may influence response rates: sampling methods, contact delivery modes, invitation strategies, the use of pre-notification and reminders, and incentives (Pan et al., 2014). The structure of the survey may also impact response rates. Hoerger (2010) has reported that the length of a survey may impact on participant dropout: it was found that 10% of the participants drop out immediately while 2% drop out for every 100 questions on the survey. The research with regard to nonresponse rates is inconclusive. Studies diverge, showing both increased and decreased nonresponse rates based on the same impact factor. Sauermann and Roach (2013) suggest that the following aspects increase the response rate: personalisation, lottery incentives and customised reminders. While Sánchez-Fernández, Muñoz-Leiva, and Montoro-Ríos (2012) found that personalisation, reminders and incentives did not improve response rates, Pedersen and Nielsen (2016) found that cash price lottery incentives are more effective than altruistic incentives. There



are a myriad of techniques to improve the response rate; these will be discussed next.

### 3 STRATEGIES USED TO IMPROVE RESPONSE RATES

McPeake et al. (2014) suggest elements such as personalisation, accessibility (ease of access to the survey), and transparency (survey length) may increase response rates. The issue of personalisation goes beyond customisation. The method of ‘impression management’ suggested by Garcia, Standlee, Bechkoff, and Cui (2009) may improve the response rate. Impression management involves personalising the facilitator of the research—this may involve including a résumé, a video or photograph of the researcher. Another possible technique is the provision of a chat room for participants to communicate directly with the researcher rather than relying on the static medium of emails. Petrovčič, Petrič, and Manfreda (2016) found that creating a sense of community can increase response rates. Contextual factors such as a researcher’s identity or affiliation may also affect the response rate. For instance, Pan et al. (2014) found that a researcher’s identity such as using a Caucasian sounding name or a prestigious sounding university affiliation, may affect the response rate positively.

The structure of the survey can also influence the response rate. Gilljam, Granberg, Holm, Karlsson, and Sundell (2013) suggest placing important questions towards the beginning of the survey. Hoerger (2010) suggests that breaking up the survey into two sections may help participants to drop out earlier rather than dropping out later, which can be problematic. He recommends that the first part of the survey should gather consent and demographical information while the second part should contain the remainder of the material. Participants who drop out may conflate the results

Text appeals may also impact the response rate. Using text appeals to the ego (Pedersen & Nielsen, 2016) and ‘pleas for help’ (Petrovčič et al., 2016) can increase response rates. McPeake et al. (2014) observed that targeting the right population may be a key determinant to improving response rates. The various techniques are summarised in Table 1.

The research methods employed concerning demographics and low response rates are discussed next.

### 4 RESEARCH METHODOLOGY

This study is based on an internal secondary analysis. Secondary analysis involves a reanalysis of information that is already available (Kolb, 2012). There are two types of sources for secondary analysis: external and internal. Internal data sources are obtained within the initiating organisation and external data sources are usually data obtained outside of an organisation (Stevens, 2006). In other words, the internal secondary analysis is done by the originators of the research. Possible limitations of secondary data are as follows: poor fit to the research question, issues of accuracy and credibility of the information (Stevens, 2006). However, as the originator of this research was involved in sourcing the primary data, it is not necessary to retest the quality and credibility of the information. Secondary data researchers often do not appreciate the challenges experienced by the originators of the research. However as this secondary analysis is conducted by the originator of the

Table 1: Strategies used in improving research rates

Strategies	Techniques
Incentives	Lottery incentives (Sauermaann & Roach, 2013); Cash incentives (Pedersen & Nielsen, 2016); Trading the results of the study (Wright, 2005).
Personalisation	Generate a sense of community (Petrovčič, Petrič, & Manfreda, 2016); Customise user invitations (Shao, Wu, Zou, & Chen, 2015); Promote a positive researcher identity (Pan, Woodside, & Meng, 2014); Dynamic communication (Garcia, Standlee, Bechkoff, & Cui, 2009); Impression management (Garcia, Standlee, Bechkoff, & Cui, 2009).
Reminders	Customised reminders (Sauermaann & Roach, 2013).
Sampling	Targeting the right population (McPeake, Bateson, & O'Neill, 2014).
Survey design	Segregating surveys (Hoerger, 2010); Transparency (survey length) (McPeake, Bateson, & O'Neill, 2014); Accessibility (ease of access to the survey) (McPeake, Bateson, & O'Neill, 2014).
Text appeals	Text appeals for help (Petrovčič, Petrič, & Manfreda, 2016); Text appeals to the ego (Pedersen & Nielsen, 2016).

research, this analysis can also benefit from a first-hand account of the challenges faced. However the researcher does concede that the reanalysis is for a completely separate purpose than the original purpose of the primary study hence this is a limitation of the current study.

The researcher selected a qualitative, descriptive analysis of secondary data. The study utilised two small data samples of 25 and 23 participants. Two case study designs were used to analyze the profile of the participants via secondary data analysis of the demographics and to have understanding of the challenges experienced by the researcher via retrospective analysis of the field notes. The focus of the study was to explore whether specific attributes of a participant's demographics could conceivably be related to the response rates and attrition rates. As Delphi and Design Science research studies are dependent on experts, it is imperative to better understand the relationship between response rates and the demographics which ultimately impacts the quality of data collected. The field notes from the primary study were used to retrospectively understand the possible reasons for the low response rates. Figure 1 illustrates the research design used in this study. Accordingly, the research question addressed in the current study was: *How do the demographic determinants of experts in internet-mediated research studies relate to response rates and attrition rates?* In the next section, the two case studies are presented.

The case studies evaluated in this paper used Google Forms for data collection. To facilitate the process, a website was created per project using Google Sites. The participants were informed about the deadlines and the objectives of the project. The consent forms and the questionnaires



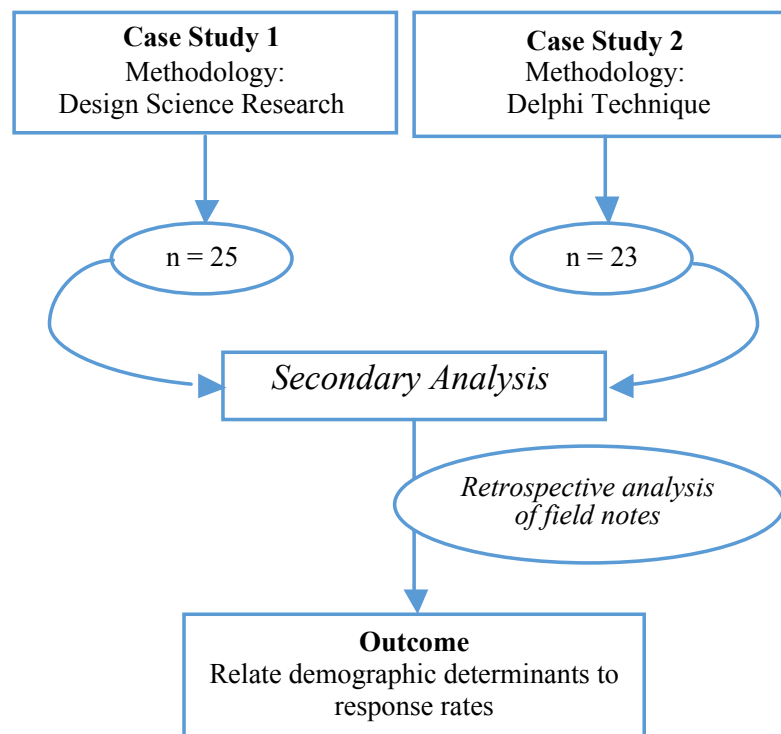


Figure 1: Research design (adapted from Venugopal, Laing, Ludman, Yellon, and Hausenloy (2010))

were embedded in the websites.

It is important to note, that the case studies are based on self-reported data. The purpose of using this set of case studies is to use authentic accounts of practice. The selection criterion was based on two representative case studies of a qualitative type; both used internet-mediated research done by experts.

## 5 CASE STUDIES

The facilitator of the research experienced no specific challenges with mediating the research projects online due to the plethora of free and highly sophisticated tools available. Due to the nature of the research, the experts in both case studies did not experience any problems with access except for one individual where the company's firewall blocked access to the web survey.

### 5.1 Case study 1: A design science research project

The design science research methodology was leveraged to conduct a small-scale experiment based on the following activities: build, evaluate, theorise, and justify (March & Smith, 1995). The experiment involved a problem-identification stage, design and development of prototype stages,

and an evaluation stage (Offerman, Levina, Schonherr, & Bub, 2009) in the design of an insider threat prevention model. The evaluation involved information security practitioners from various organisations. The purpose of this process was to identify whether there were any vacuities, ambiguities or inconsistencies in the model concept. During the evaluation stage the participants viewed a demonstration of the prototype and the model concept via online videos (Padayachee, 2014b) and provided value judgements in terms of the efficacy of the security mechanism provided by the product concept. Both qualitative and quantitative data collections were employed, as well as open-ended questions and a structured questionnaire. This study was conducted in early 2014 (Padayachee, 2015).

### 5.1.1 Procedure

As this study was conducted entirely online, it was decided that the typical method of allowing the participants to interact with the prototype whilst being guided would not work. Thus, a website was developed that contained two YouTube videos. The first video demonstrated the model concept while the second video demonstrated the prototype. The questionnaires, consent forms and an executable version of the prototype were also available online.

### 5.1.2 Response rate

This research required experts from the information security domain. Using a professional network (LinkedIn), this type of demographic was easy to identify. A database of participants ( $n = 200$ ) was downloaded off the social media site and each participant was invited to participate. At this point at least 25% of the participants agreed that they would like to participate in the research. However, once the participants received the website details, the participation dropped to 12.5%. This attrition occurred in both studies.

### 5.1.3 Demographic determinants

Table 2 summarises the qualification profile of the respondents vs. the non-respondents. It was found that a large proportion of the participants had formal qualifications (60%), while a few participants ( $n = 2$ ) had no tertiary qualifications. The largest proportion of respondents relative to the population came from the postgraduates (17%), while only 4% of the population with no qualifications participated. Overall 14% of the population with formal qualifications participated while 10.5% of the population without formal qualifications or no qualifications participated. Hence it is not conclusive to say that individuals with formal qualifications are more likely to participate.

The population were grouped into categories as shown in Table 3 (information security supervisor ( $n = 6$ ); information security and risk supervisor ( $n = 5$ ); information security operations supervisor ( $n = 2$ ); information security analyst ( $n = 5$ ), information security specialists ( $n = 5$ ); Information security administrator ( $n = 1$ ); information security technical specialists ( $n = 1$ )). Table 3 shows that security experts in supervisory roles collectively (20%) have a high degree of interest in online research related to their subject field. Although the sample was composed of 33% of supervisors,

Table 2: Qualifications profile of respondents vs. non-respondents

Qualifications	Non-respondents ( <i>n</i> = 175)	Respondents ( <i>n</i> = 25)	Total	Response ratio
First degree	34	5	39	13%
Postgrad. degree	39	8	47	17%
Diploma	17	2	19	11%
Certificate	42	8	50	16%
None	43	2	45	4%
	175	25	200	13%

proportionally the highest ratio of participants to the total number of participants in that specific category was composed of supervisors.

Table 3: Career profile of respondents vs. non-respondents

Job description	Non-respondents ( <i>n</i> = 175)	Respondents ( <i>n</i> = 25)	Total	Response ratio
Information security supervisor	39	6	45	13%
Information security and risk supervisor	11	5	16	31%
Information security operations supervisor	2	2	4	50%
Information security specialist	57	5	62	8%
Information security analyst	28	5	33	15%
Information security administrator	12	1	13	8%
Information security technical specialist	18	1	19	5%
Information security sales	7	0	7	0%
Information security auditor	1	0	1	0%
	175	25	200	13%

Table 4 summarises the relative experience of the respondents vs. non-respondents. This analysis demonstrates that individuals with higher levels of experience in the subject matter were less inclined to participate in the study. However the other probability exists that older individuals are less likely to have online presence or are more cautious as it shown that there are fewer respondents in more experienced categories. Overall individuals between 0–10 years' experience were more likely to participate (14%) than individuals with more than 10 years' experience (8%).

This study showed that experts with qualifications and in supervisory positions are marginally more likely to participate while experts with more than 10 years' experience are less likely to participate.

Table 4: Years of experience of respondents vs. non-respondents

Years of experience	Non-respondents ( <i>n</i> = 175)	Respondents ( <i>n</i> = 25)	Total	Response ratio
0–5 years	53	7	60	12%
5–10 years	66	13	79	16%
10–15 years	31	2	33	6%
15+ years	25	3	28	11%
	175	25	200	13%

## 5.2 Case study 2: A Delphi research project

The main objective of this research was to develop a framework of information security measures from an opportunity-reducing perspective to mitigate the insider threat. The Delphi technique is an iterative process where experts anonymously provide group judgement and they have the opportunity to revise their reviews by receiving controlled feedback until they reach consensus (Linstone & Turoff, 1975). This research involved a three-round Delphi process with 23 information security experts from industry. To increase the response rate, a nested sample of 11 experts was involved in Phases 2 and 3; this was based on the availability of the participants. Consequently the experts were divided into two panels: the main group and the core group. All rounds were conducted via email. This study provides an ideal opportunity to perform a comparative analysis between the participants that remained (i.e. the core group) and the dropouts (i.e. the attrition rate). This study was conducted in the first quarter of 2014 (Padayachee, 2016)).

### 5.2.1 Procedure

The phases were conducted via email as follows (Padayachee, 2014a):

- Phase 1 (Brainstorming sessions): The main group responded to five open ended questions—providing as many opportunity-reducing techniques as possible.
- Phase 2 (Consolidation): The core group provided their value judgement on the techniques proposed (i.e. fit for purpose (agree or disagree). Thereafter the findings were consolidated and lower ranked techniques (<55%) were eliminated.
- Phase 3 (Refinement): The core group reviewed the consolidated list (composed of highly ranked [70%–100%] and moderately ranked [55%–69%] techniques) until the threshold level (70%) of consensus was reached.

In the final round the consensus implied that the consolidated list represented a list of satisfactory techniques.

### 5.2.2 Response rate

Initially a sample of ( $n = 250$ ) were invited, however, only 23 participants responded to the call for participation. The sample of 23 participants was selected using a professional network (LinkedIn). The experts from industry were from a cross-section within the information security domain ranging from banking and information security consultancies to information technology service management. The quality of the findings also depends on the capability of the panel. The main panel had on average 8.09 years of experience, while the core group had 7.5 years of experience. The high dropout rate resulted in convenience sampling—dependent on the participant’s availability. As the research was not conducted face-to-face there was disinvestment. Initially there were 23 participants, but as the project entered the next iteration, the participants dropped to 11 (i.e. the core group).

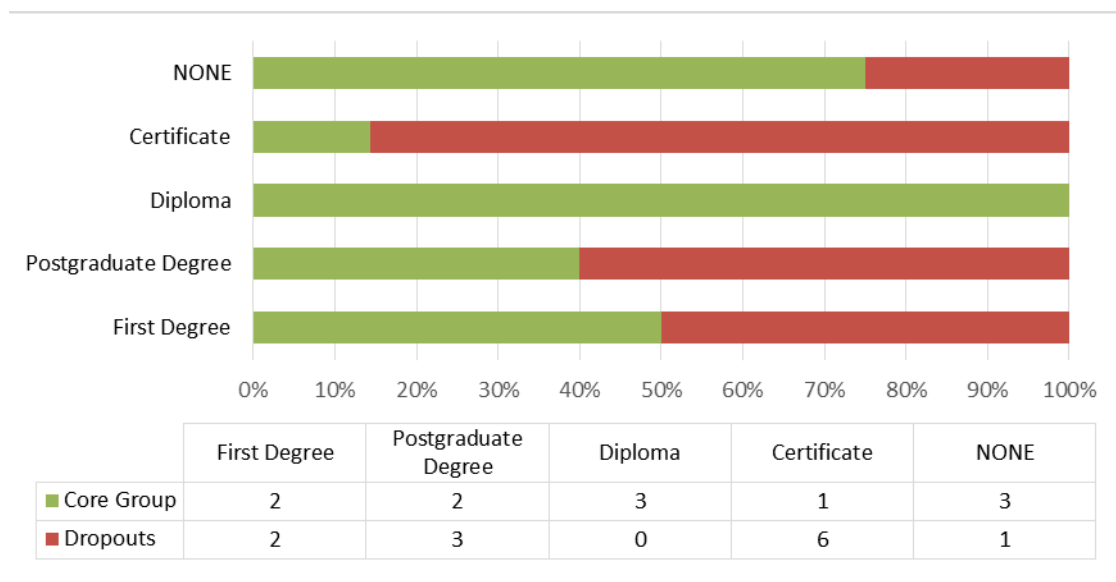


Figure 2: Comparative analysis of qualifications (core group vs dropouts)

### 5.2.3 Demographic determinants

Figure 2 depicts the qualification profile of the core group versus the dropouts. With respect to qualifications, it appears that the largest proportion of dropouts occurred within the group that had non-formal qualifications (certification). On average those with formal qualifications (first degree, postgraduate degrees and diploma) formed 63% of the core group whereas only 42% of the dropouts had formal qualifications. It appears that participants with formal qualifications are more likely to participate. The fact that the core group contained a larger proportion of participants with qualifications supports the findings of the previous case study to some extent, which found that individuals with formal qualifications may be marginally more interested in participating in studies

conducted online. In proportion to the groups, 42% of the individuals with formal qualifications dropped out while 64% of the individuals with no or non-formal qualifications dropped out.

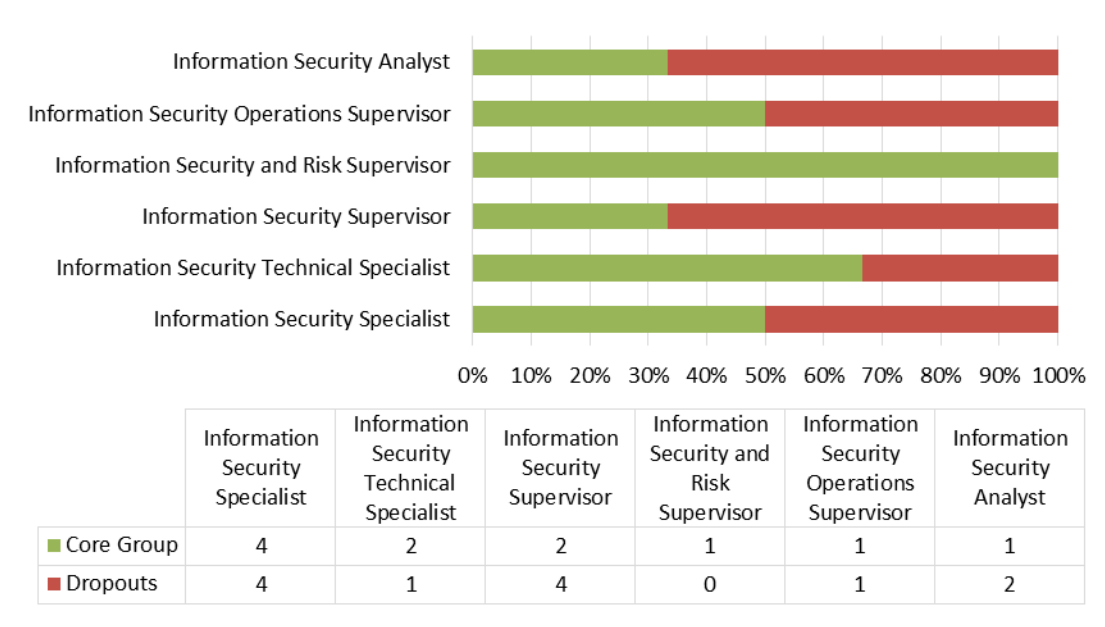


Figure 3: Comparative analysis of job descriptions (core group vs dropouts)

The population was grouped into categories: Information Security Specialist ( $n = 8$ ); Information Security Technical Specialist ( $n = 3$ ); Information Security Supervisor ( $n = 6$ ); Information Security and Risk Supervisor ( $n = 1$ ); Information Security Operations Supervisor ( $n = 2$ ); Information Security Analyst ( $n = 3$ ). Figure 3 depicts job category profiles of the core group versus the dropouts. The largest proportion of dropouts consisted of participants who were non-supervisors. Half of the total number of non-supervisors ( $n = 14$ ) dropped out the study while marginally more than half of the supervisors ( $n = 9$ ) dropped out as well. Hence the dropout rate of 52% appears to be evenly distributed among participants in supervisory and non-supervisory roles.

Figure 4 depicts the relative experience of the respondents. In this comparative analysis the highest proportion of dropouts were from the 5–10 years of experience category. On average 62.5% of the total number of the participants ( $n = 16$ ) with between 0–10 years of experience dropped out of the study. In the previous case study it was shown that participants with between 0–10 years were more likely to participate. But in this case study, it shows that these individuals are also more likely to drop out. It is significant to note that the attrition rate of participants with more than ten years of experience was relatively low, i.e. 28.6% of the proportion of the total number of participants with more than 10 years of experience ( $n = 7$ ) compared with the other groups.

In the next section the implications of the findings with respect to internet-mediated research are explored.



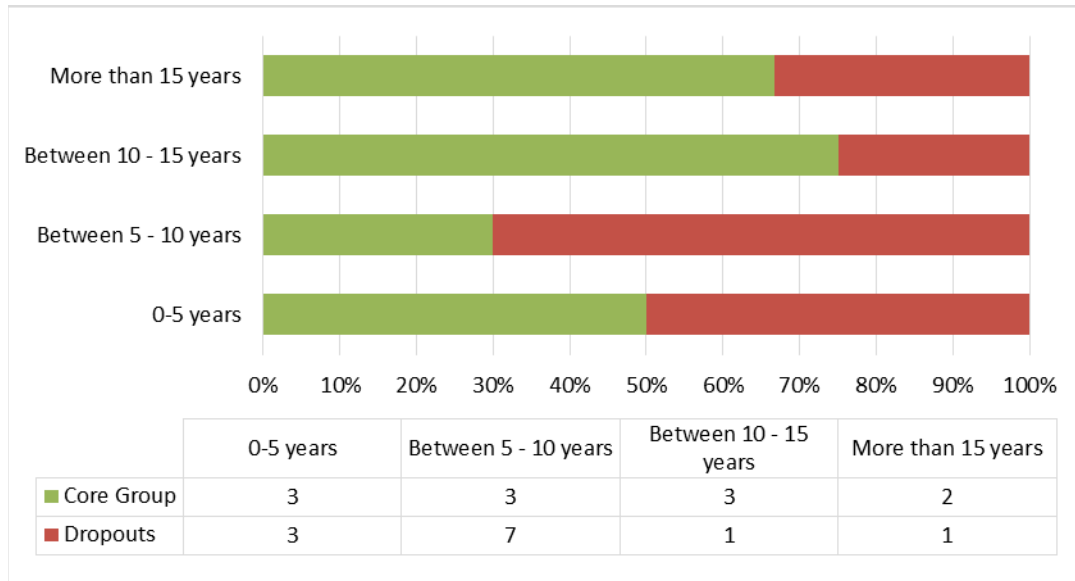


Figure 4: Comparative analysis of experience levels (core group vs dropouts)

## 6 DISCUSSION

The main challenge experienced was the poor response rates and high attrition rates. Whitehead (2007) conducted a meta-analysis on several internet-mediated studies and it was clear that, irrespective of traditional or internet-based methods, unsolicited email elicited poor response rates. It was assumed that using social media groups may improve participation as it may be more acceptable than an unsolicited email. The case studies presented in this paper show, however, that this approach elicits a poor response as well. Requesting the same sample of respondents to participate for a second time failed. As clearly demonstrated by the Delphi study (Case Study 2) where the attrition rate was 52%, participants become fatigued by the numerous requests for participation. This demonstrates that Delphi studies require more input by the facilitator to ensure continuation. Although the Design Science Research case study is also iterative, it is possible to recruit more participants for the next phase of the research.

The following strategies were used to increase response rates: personalisation, incentives, customised reminders. In terms of the two case studies, no cash incentives were provided. However the results of the research were offered as an incentive. This technique did not significantly improve the response rate, although there was no comparative test done to prove that offering no feedback would have lowered the response rate further. The facilitator of the research was persistent and sent out several customised reminders and extended the deadlines. However most participants ignored the repeated requests which is contrary to the findings by Sauermann and Roach (2013) who changed the reminders over the cycle of the research which may have positively influenced the response rate. The facilitator found that personalisation was more effective than placing impersonal requests

for participation on forums. The facilitator posted links to surveys on several forums and social media groups. In both instances this method failed to deliver a single response, while delivering a personalised email (which was more time consuming) produced a better result. This finding is confirmed by Shao et al. (2015) and Sinclair et al. (2012). Shao et al. (2015) found empirically that customizing user invitations by analyzing user attributes can improve response rates, while Sinclair et al. (2012) found that personalising invites produced better response rates.

The validity of both studies is highly contingent on the proficiency of the experts involved. Information provided in the sample profiles within the public domain may have been misrepresented; therefore it may be necessary to use strategies to avoid misrepresentation. Possible techniques to circumvent this problem could involve creating screening tools and identifying experts through professional bodies (Donohoe, Stollefson, & Tennant, 2012). As both studies were qualitative in nature it is incumbent to also comment on the quality of the data collected. With the Delphi technique (Case Study 2) the responses averaged 101.7 words per participant in round 1 (note: this applies only to those participants that completed the web-based survey in round 1 ( $n = 14$ )). Some participants ( $n = 9$ ) emailed their responses, while the responses in the design science research (Case Study 1) averaged 208.8 words per participant. It is evident that the quality of data collected was sufficient to form conclusions in order to achieve the respective research objectives.

There were several observations noted in the study. In Case Study 1, more than half of the population (52.5%) had formal qualifications. Case Study 1 revealed those with formal qualifications were marginally more likely to participate while Case Study 2 revealed that those with formal qualifications were less likely to drop out. A large proportion of the population in the Case Study 1 were in non-supervisory roles (67.5%). However only 9% of that population agreed to be a part of the study. Case Study 2 disclosed the dropout rate among those in supervisory roles versus those in non-supervisory roles appear to be evenly distributed. A large proportion of the population in Case Study 1 had less than ten years' experience (69.5%). These individuals were more likely to participate. However Case Study 2, shows these individuals with less than 10 years' experience are also more likely to drop out. Comparatively, Mlikotic et al. (2016) found that younger participants and those at a higher education level were more likely to participate in an online survey.

A key limitation of this research was that data collected cannot be generalised and hence these causalities cannot be confirmed. Another key limitation could be the mode of communication used. Perhaps using other modes such as discussion forums or social media platforms such as Facebook would have changed the response rate. However the observations detailed may improve the understanding of conducting online research.

## 7 RECOMMENDATIONS

The following recommendations are offered as possible ways to improve the response rates of both case studies. With respect to Case Study 1, viewing the design science research as a method of co-innovation may help to improve the response rate (Helms, Booij, & Spruit, 2012). A participant may be more willing to participate if the process is enjoyable and entertaining, and if the notions of deeper insight and knowledge into the product or technology is promoted (Dvorak, 2013). In Case

Study 2, the use of real-time Delphi methodology instead of the traditional method is recommended. Gnatzy, Warth, von der Gracht, and Darkow (2011) suggest that this may reduce the dropout rate significantly as it shortens the respondents' participation time. The traditional method involves several rounds and lag-time between rounds in order for the facilitator to consolidate the results. Real-time Delphi involves the participants changing their responses in real-time relative to the other participants' responses, as many times as required.

## 8 CONCLUSION

In this paper the issues and challenges, and more specifically the low response rates surrounding internet-mediated research were reviewed. The paper provided an analysis of the several techniques that could be used to improve response rates. Additionally, two case studies were presented to demonstrate the authentic experience of using internet-mediated research for more than typical survey research. The advantages of conducting internet-mediated research are numerous, however, the major problems appear to be high attrition rates and low response rates. More research is required to determine how online participation can be improved. This research found that there are possible links between demographic determinants such as qualifications, career profiles and years of experience and response rates.

Experts with formal qualifications are more likely to participate. Experts in senior positions appear to be more interested in research participation. Dropout attrition rates were calculated based on the number of experts who did not complete the second round of the Delphi study. It was found that experts with more years of experience and formal qualifications are less likely to drop out. Perhaps some of these findings indicate that maturity and expertise may be key elements to predicting both response and attrition rates. These conclusions reported here should however be considered with caution, given the small sample sizes.

Future research should involve considering various demographic determinants such as qualifications, job description and years of experience relative to the techniques of personalisation, lottery incentives and customised reminders. The objective will be to determine which of these techniques will be most likely to increase the response rate with respect to the specific demographic determinants. A sufficiently large sample size will be used to offset the limitations of the current study.

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