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Abstract

The majority of research within information systems (IS) may be categorized into two key perspectives, natural science and design science. While natural science seeks to develop and verify theories that explain phenomena, design science attempts to solve human and organizational problems through the creation of innovative artefacts. An important aspect of design science investigations is the evaluation of the design artefact. Focus groups are a well-established research approach in the social sciences. However, focus groups are rarely mentioned in the IS literature addressing design science evaluation methods. Given the increased interest in design science research, this paper reports on the successful application of focus groups in the evaluation of an IS design artefact. The paper discusses the objectives and design of the focus group sessions, participant selection, the role of the facilitator, the facility used for the sessions, and the data analysis procedures. The paper then provides a set of guidelines that should assist other IS design science researchers with focus group-based evaluation.

Keywords

Focus groups, design science, evaluation

Introduction

The majority of IS research may be categorized into two fundamental perspectives, natural science and design science (March and Smith 1995). This paper is concerned with design science and in particular the evaluation of design science projects. One way that researchers improve their designs is to test and evaluate their effectiveness. Evaluation activities identify the strengths and weakness of the design, and provide a feedback loop for further development and refinement of the design artefact. There are a number of options available in evaluating the efficacy of artefacts, one such method is focus group. Focus groups are a group interview technique, that allow for the rich collection of focused data to be gathered using a number of participants.

This paper addresses the use of focus groups as an evaluation method in IS design science research. The next major section discusses design science with a focus on the evaluation cycle of design research. The next major section addresses focus groups as a qualitative research method, and identifies a number of strengths and weaknesses to the approach. The paper then explores the successful use of focus groups in a recent business intelligence research project. The paper then proposes a number of guidelines, which provide direction to researchers considering adopting focus groups in their research. The paper concludes by arguing that focus groups should be more widely used as an evaluation method in IS design science research, and their usefulness acknowledged in the key literature on design science research in IS.

Design Science in Information Systems Research

Design science is an alternative, or complement, to the natural science approach that is dominant in information systems research. In design science the researcher "creates and evaluates IT artefacts intended to solve identified organisational problems" (Hevner et al. 2004). March and Smith (1995) clearly draw the distinction between natural and design science: "Whereas natural science tries to understand reality, design science attempts to create things that serve human purposes" (p.253). The first major attempt to theorize about IS design science was Walls, Widmeyer and El Sawy (1992) in their development of an information systems design theory for executive information systems. An important issue is the difference between high quality professional design and design science research. A design science research program should include the definition of research problems and suggestions, data gathering, data analysis, and the interpretation and discussion of the research outcomes. Design research should also address intellectually important topics; this intellectual importance is associated with intellectual risk. In addition, design science research should produce important and interesting contributions to both IS theory and practice.

Design science is gaining momentum in IS research. The publication of guidelines for the assessment of design science projects in *MIS Quarterly* (Hevner et al. 2004) was an important milestone for IS design science researchers. Recent IS design science projects have been published in Tier 1 North American and European journals (Arnott 2006; Markus, Majchrzak & Gasser 2002; Siponen & Iivari 2006) indicating the acceptance of design science as an appropriate direction for IS scholars. A design research page was added to AISWorld Net in 2000 (http://www.aisworld.org/Researchdesign/drisISworld.htm). The first international conference in IS design science was conducted in 2006 (http://ncl.cgu.edu/designconference/) and is planned as an annual event. Further, a special issue of *MIS Quarterly* on design science is planned. It is likely that design science will increase its presence in IS research and it is important that this increase of design science activity is informed by appropriate methodologies and in particular by appropriate approaches to evaluating design processes and artefacts.

Design Science Methodology

Figure 1 shows the research processes that can comprise a design science project. This was the approach used by Arnott (2006) for a design science project in the personal decision support systems area. This approach was adapted from Takeda et al. (1990) and Vaishnavi and Kuechler (2006), who proposed a design research methodology with the major process steps of awareness of problem, suggestion, development, evaluation and conclusion.

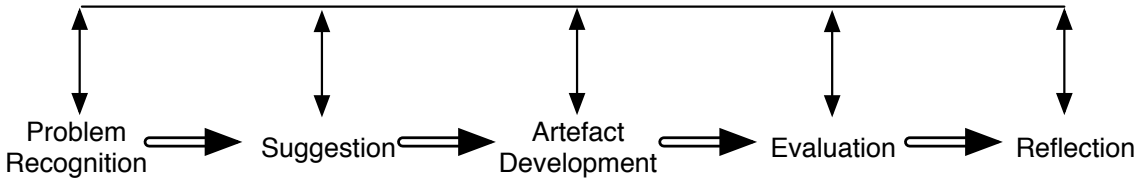

Figure 1: The Processes of Design Science Research.

The problem recognition phase involves the identification of the IS problem that the design science project will address. The research questions are identified and specified. The suggestion phase is often difficult to separate from problem recognition. It involves using available theory and professional experience to propose a solution or answer to the research question. The third phase, artefact development, is the heart of a design science project. March and Smith (1995) define IT design artefacts as constructs, models, methods, or instantiations. From an IS perspective an IT artefact should be seen in its social context. In the fourth phase, evaluation, researchers can use a variety of methods and techniques from different IS research traditions. This will be explored in more detail in the next sub-section. The choice of evaluation approach should be largely guided by the nature of the research questions. The final phase, reflection, involves the identification of the project's contribution to theory and practice, its limitations, and the identification of possible directions for further research, which may or may not be design science in nature.

Evaluating Design Science Artefacts

To evaluate is to assess worth or 'goodness'. Evaluation is an integral part of design activities as the evaluation process provides an important feedback loop for the continued refinement and evolution of a design artefact. March and Smith (1995) state that we build an artefact to perform a specific task, and that the basic question is, does it work? Evaluation provides the input for the developer to progress the artefact from less-effective to more-effective versions.

Recent work on design science in IS has provided some guidance on evaluation methods. Hevner et al. (2004) note that the utility, quality, and efficacy of design artefacts must be rigorously demonstrated through effectively planned evaluation procedures. They suggest that, as in the justification of behavioral science theory, the evaluation of design science artefacts calls for the definition of appropriate metrics, and the potential analysis of data. The evaluation process is an inherently incremental process, and provides a feedback loop for improvement of the artefact during construction. Hevner et al. (2004) remark that the evaluation of design artefacts normally occurs using techniques from existing IS research. These techniques are summarized in Table 1 (Hevner et al. 2004**,** Table 2, p 86). Table 1 identifies a number of evaluation methods, categorized under five key types. Hevner et al. argue that the evaluation method must be suitably matched with the designed artefact and the available evaluation methods. They also suggest that the goodness of a design artefact may be rigorously demonstrated through well-chosen evaluation techniques.

Table 1: Hevner et al's Design Evaluation Methods.

Design Evaluation Methods	
1. Observational	Case Study: Study artefact in depth in business environment.
	Field Study: Monitor use of artefact in multiple projects.
2. Analytical	Static Analysis: Examine structure of artefact for static qualities.
	Architecture Analysis: Study fit of artefact into technical IS architecture.
	Optimization: Demonstrate inherent optimal properties of artefact or provide optimality bounds on artefact behavior.
	Dynamic Analysis: Study artefact in use for dynamic qualities.
3. Experimental	Controlled Experiment: Study artefact in controlled environments.
	Simulation: Execute artefact with artificial data.
4. Testing	Functional (Black Box) Testing: Execute artefact interfaces to discover failures and identify artefacts.
	Structural (White Box) Testing: Perform coverage testing of some metric in the artefact implementation.
5. Descriptive	Informed Argument: Use information from the knowledge base to build a convincing argument for the artefact's utility.
	Scenarios: Construct detailed scenarios around the artefact to demonstrate its utility.

The Hevner et al. (2004) *MIS Quarterly* published guidelines are likely to be very influential with IS journal reviewers, editors, and researchers. As a result, a case needs to be made to include evaluation approaches that are missing from Table 1. This paper argues that focus groups should be included as a method for evaluating the efficacy, quality, and utility of design science artefacts in IS. The next section discusses the general nature of focus groups. The following section provides an example of the successful use of focus groups to evaluate an IS design science artefact.

Focus Groups as Qualitative Research

Focus groups are a widely used research method in the social sciences. In a focus group participants are asked their opinions toward a product, idea, or concept. The interactive group setting allows for free discussion between the participants. Accordingly, focus groups are defined as "a research technique that collects data through group interaction on a topic determined by the researcher" (Morgan 1997). It is the researcher's interest that provides the focus of the group, and the data is obtained through the interaction of the group. This definition of focus group research excludes other group research techniques, such as Delphi or nominal group techniques, where there is generally no direct group interaction (Stewart & Shamdasani 1990). Observations of naturally occurring groups are also excluded from this definition, as the researcher has little influence on the topic of discussion. Focus groups are synchronous meetings where the participants are present in the same place at the same time.

As a qualitative research method, focus groups are situated somewhere between two key methods of collecting qualitative data in the social sciences (Morgan 1997), participant observation and open-ended or semi-structured interviews. Participant observation normally occurs in groups, however focus groups allow the researcher to observe a significant amount of interaction, on a specific topic, in a limited period of time. Although a clear benefit of participant observation is a more natural observation setting, the disadvantage is the difficulty in locating, and obtaining access to sites. It is a question of judgment by the researchers to decide between obtaining data from a more natural setting in participant observation, and the ability to collect a rich, concentrated set of data, in a short timeframe in a focus group. Focus groups, compared to individual interviews, allow the researcher to observe an interactive discussion between participants. Group discussions allow for a range of opinions to be expressed, providing a rich data set, and the ability to draw conclusions about contrasts or similarities in opinion.

An Example of Focus Groups as an Evaluation Method in Design Science Research

This section describes the successful use of focus groups as an evaluation method for design science research. It begins with an overview of the project, and identifies the objectives of the group sessions. It outlines the selection process for participants, and discusses the role of the facilitator, assistant and observers. The facility used to conduct the sessions is explained, and the facilitator guide is described. The sessions themselves are then discussed, followed by the analysis approach and findings.

Project Background

A business intelligence (BI) system is an IT application that aims to provide business value by improving the effectiveness of managerial decision-making. In a competitive business environment, the general value of strategic information systems, such as BI, is easily recognized. Regulatory concerns, and an increasing quantity of data stored in operational systems have led to high adoption rates of BI software and services (Kemp 2005). BI has recently been named as the top technology priority for CIO's in 2007 (Gartner 2007). This suggests that these systems are the principal provider of decision support in contemporary organizations.

Many large-scale business investments are screened using some form of evaluation process or method. The benefits of BI systems are such that much of their value is difficult to identify using traditional evaluation techniques. Commonly used financially-based evaluation techniques are inadequate when they are required to identify the soft, intangible benefits often provided by BI systems. The research project that provided the example for this paper concerns the evaluation of BI systems in order to assess their worth to the adopting organization. The project's design artefact is a practitioner-focused structured method for identifying and tracking the value of BI investments. Two focus group sessions were used as a method of evaluating the artefact.

Objectives of the Focus Groups

Following a detailed review of the BI literature, information systems evaluation techniques, and a case study involving a large financial institution, a method for the evaluation of BI investments was developed. As discussed, the design science research paradigm calls for the continued evaluation and refinement of design artefacts. Focus groups were chosen for the first evaluation cycle to obtain opinions from senior BI specialists on the feasibility and effectiveness of the draft BI benefits management method. The data obtained from the focus group sessions was used to further refine and build the method. The artefact being evaluated consisted of two documents. The first document presented the method, a strategy for managing the benefits of business intelligence investments. It contained a description of the method, how it can be used within an organization, guidance on how the method supports BI-enabled business change, and a description on how to best identify, define, manage, and track the expected benefits from BI-enabled business change. The second document included a template that was intended to assist the implementation of the method.

Participant Selection & Characteristics

The recruitment process was aimed at increasing the likelihood of obtaining data from a wide range of perceptions and experiences, and to reduce sampling bias (Morgan 1997). Initially, face-to-face meetings were held with senior managers. These managers identified potential participants within their organizations, and approached them directly. These employees, if interested, contacted the researchers directly, to comply with privacy legislation, and to avoid potential coercion. Participants that agreed were posted a formal explanatory statement, written consent form, and a copy of the draft artefact documents.

Seven executives participated in the focus group sessions. All had significant BI experience and knowledge and completed a brief demographic questionnaire at the conclusion of the sessions. All participants were very familiar with the term 'BI', with experience ranging from three to 15 years (average 8.7 years) (see Table 2). The majority of the participants had been involved with the development of business cases for BI projects, with 65 business cases being developed, an average of nine per participant. The participants had managed 125 BI projects between them, with an average of 18 projects each. They had also designed a total of 83 BI systems, implemented 53, and evaluated approximately 34. These descriptive statistics clearly identify the seniority of the focus group participants.

Table 2: Focus Group Participant Overview

Participant	Role/background	Years Familiar with BI
Participant 1	Practice manager for a medium sized business and IT services company. The organization is technology and vendor independent, and is focused on enabling a data-driven approach to solving business problems.; has approximately 25 people reporting to him, reports directly to the managing director.	10
Participant 2	Program manager for a very large communications company, Reports directly to the general manager (strategy). With a large number of project managers, business and IT analysts reporting to him, has an operating budget in the tens of millions of dollars, and is currently leading one of the largest BI initiatives in the Asia/Pacific region.	10
Participant 3	Senior project officer in one of the largest Australian universities, currently managing the first stage of a large BI initiative within his organization, has a number of developers and technical leads reporting to him.	8

Participant	Role/background	Years Familiar with BI
Participant 4	Has a PhD in the data warehousing field, principal consultant for an industry-leading software vendor, specializing in business performance management products, has designed more than 40 BI solutions.	7
Participant 5	Manager of BI and CPM solutions, works for one of the worlds' largest business consulting organizations, servicing more than 2000 international organizations.	8
Participant 6	Manager of Information Management at one of Australia's largest financial organizations, has extensive knowledge in the BI field, and has also worked as a consultant for a very-large business consulting organization.	15
Participant 7	Managing Director of a medium-sized business consulting firm, has developed a large number of business cases for BI projects, has significant experience in managing BI projects.	3

The Group Facilitator, Assistant and Observers

Scott (1987) states that the choice of a facilitator is critical, acknowledging "..moderators have the difficult task of dealing with dynamics that constantly evolve during a focus group discussion. They must know how to handle the 'rational man' syndrome, in which respondents give the 'right' or 'socially acceptable' answer." The facilitator's role primarily consisted of directing the discussion, keeping it flowing, and taking notes (Krueger & Casey 2000). A facilitator should facilitate the group, not control it (Bloor et al. 2002), they should act as a background member to the group, not an active participant. The facilitator, although not leading the group, must also seek to avoid over-domination of the group by any one participant. This, in part, will have something to do with group composition. For example, avoiding participants with differing seniorities. Further, it relates to the skills and experiences of the facilitator in dealing with potential threats to the groups, and making it clear to participants that differences of opinion are welcomed. Likewise, if there are comments made by a participant that receive little agreement from other participants, then the facilitator should take the initiative to see if there is, in fact, consensus (Bloor et al. 2002).

Another important stakeholder during the focus group sessions was the assistant. The assistant to the focus group was a colleague working in the same research centre. The use of an assistant provided means for dealing with potential distractions and interruptions during the focus group sessions (Krueger & Casey 2000), such as late arrivals and excess noise. The assistant had the tasks of welcoming the participants as they arrived, organizing for refreshments to be served, and giving an overview of proceedings to date to any latecomers.

Observers are common in focus group research (Stewart & Shamdasani 1990). The observers, in this case, consisted of two of the researchers for the project. Participants were informed at the beginning of the sessions that there were observers watching the proceedings. They were also informed of their identity and their role in the research project. The observers viewed live video of the focus group sessions in a nearby office. The role of the observers was to witness the proceedings and to take detailed notes on the discussion. These notes were used at the conclusion of the first session, in consultation with the facilitator, to refocus the second session's line of questioning.

The Focus Group Facility

The nature of the focus group facility can contribute to the success or failure of the research (Greenbaum 1993). The site represented a balance of requirements for those involved, in that it was cost effective, comfortable, allowed for the sessions to be recorded, and was easily accessible for the participants, being only a short distance from the central business district. The facility was free from interruptions and unauthorized surveillance from non-participants, and there was very little background noise. The observation room was modular, which allowed for the setup of the room to be customized according to the needs of the sessions. The observation room was equipped with a large meeting table and comfortable seating for eight people. A large whiteboard was installed at the end of the room, and high-quality video recording equipment was located in opposite corners of the facility to capture the sessions from multiple perspectives. Video recording was beneficial, as it provided the practical advantage of easily determining who is speaking, and in conversations, who was speaking to whom.

Focus Group Facilitator Guide

A facilitator guide was developed to set the agenda for the discussion of the group (Stewart & Shamdasani 1990). Greenbaum (1993) notes that an effective facilitator guide is one of three key success factors for focus group research, along with the quality of the facilitator and the correct recruitment of participants. The development of the guide was informed by the research questions and the objectives of the focus group sessions. The guide went through several iterations of review and revision before being finalized. Care was also taken with the wording of the guide's questions (Stewart & Shamdasani 1990). Long and complex questions were

avoided, for ease of comprehension. Following the guidelines of Krueger and Casey (2000) Table 3 outlines the structure and content of the facilitator guide for this project.

Table 3: Components of the Facilitator Guide.

Guide Components	Content
Introductory Stage	This stage introduces the topics for discussion, and aims to get participants thinking about their connection with the topics. This included an introduction by the moderator, an overview of the purpose of the group and proceedings to take place. An alert to the recording equipment in the observation room, that observers were present during proceedings, and other ethical observations of the research. A warm up question, aimed at easing the participants into the line of questioning and discussion.
Transition Stage	This stage moves the conversation toward the key topics that are driving the research effort. The facilitator asked substantive questions that transitioned to the key questions of the sessions. These included discussion points on issues surrounding the evaluation of BI systems.
In-depth Investigation	The questions posed during this stage are the 'driving force' of the research effort. The facilitator progressed into concrete discussion of the key issues for the focus group. These questions revolved around the draft documents that were sent to participants.
Closure	Bringing closure to the proceedings, the moderator raised the key issues that were discussed by the participants, and requested any closing comments. The facilitator thanked the participants for their time, and the focus group session was concluded.

The Sessions

On arrival, participants were welcomed by the facilitator, thanked for their attendance, provided with a nameplate, and offered refreshments. In the lead up to the beginning of the first session, the facilitator and several colleagues, entertained the participants, and made them feel comfortable. These colleagues returned during the break between sessions.

The first focus group session began at 2:00pm.The facilitator provided a detailed overview of the purpose of the sessions, and discussed the criteria for selecting participants. Participants were informed that their input would be used to refine and improve the design artefact. The facilitator then outlined the basic 'ground rules' for the sessions. These included encouragement for participation, and that honesty and openness were welcomed. Participants were asked to give examples and talk about their own experiences. They were requested to listen to the input of others without interruption, and it was stressed that it was acceptable to disagree. The facilitator outlined the structure of the sessions and the agenda. The participants were made aware of the legal and ethical requirements imposed on the research by the University, and were requested to read the research explanatory statement, and sign the associated consent form. The confidentiality of the sessions was stressed, and those with access to the raw data were identified. Attention was then drawn to the recording equipment in the room, and participants were made aware that there were observers to the sessions, viewing through a high-speed web camera link.

The participants were then asked to identify themselves to the group, and briefly state how their experience related to the purpose of the focus group sessions. This concluded the introductory stage of the focus group, and the facilitator began formal proceedings with an introductory question to begin substantive discussion and introduce the topic.

The first focus group session concluded at 3:15pm, after more than an hour of detailed discussion. The participants then had 30 minutes to relax and speak informally, while the facilitator and researchers met. The aim of this meeting was to review the first session and to redirect discussion for the second session. Topics raised in the first session, which were originally planned for discussion in the second session, were removed. Questions were also added to obtain more detail in the second session about unexpected comments which were felt to be valuable. The second formal focus group session began at 3:45, where the remainder of the questions were asked and discussed. Formal proceedings ended at 4:45pm. At the conclusion of the final session, the participants were asked to complete a brief questionnaire. Supplementing the focus group sessions with a brief questionnaire provided the advantage of obtaining demographic data from the participants without impacting on the focus group sessions. The questionnaire was distributed at the conclusion of the sessions, which eliminated the possible bias of the group discussion being directed by the questionnaire content, and any potential changes in attitudes (Morgan 1997). Refreshments were arranged at the conclusion of the final session.

Focus Group Analysis

Analysis of the data began by explicitly recalling the purpose of the focus groups, and the intensity of the analysis was guided by the purpose of the study (Krueger & Casey 2000). Shortly after the focus group sessions, the video recordings of the focus group sessions were reviewed, and unabridged transcripts of the proceedings were generated as the basis for analysis. Transcription of video recordings is a lengthy process. Much of the

literature surrounding transcription processes can be found in texts addressing discourse analysis (Bloor et al. 2002) and much of this literature is focused on the speech of participants, and has high levels of detail focusing on timing of pauses in speech, intonation, and organization, so that overlaps may be seen. For the detailed analysis of focus group data, some of these techniques are useful. The number of speakers involved in the transcript made the transcription process lengthier than one-on-one interviews, although the use of video recording equipment made identification of speakers an easier task. Every effort was made to record all speech from the two sessions; it was fortunate that participants didn't speak over one another, which simplified transcription. Speech was also transcribed as it occurred, and not 'cleansed', for example, participants rarely spoke in neat sentences, 'ums' and 'ers' were retained in the transcription, along with any gestures, such as nods of agreement with the speaker. This level of transcribing provided extra richness to the data. Speakers were also identified in the transcript, so their comments could then be related back to their background and experience.

A transcript of each of the two sessions amounted to 45 pages of text. These transcripts were reviewed by each of the participants, and checked for accuracy. There were a small number of corrections requested by the participants. In particular, commercially-sensitive information was removed.

The transcripts were then analysed with appropriate codes and categories added to them, this involved a number of passes through the data. The transcripts were printed with wide margins, allowing for notes to be added during analysis, and each line of the transcript was numbered for easy referencing. The categories were color-coded to identify sections, and text was matched to color categories where appropriate. During analysis, the transcripts were supplemented with field notes taken by the facilitator and observers during the sessions. The write up of the focus group analysis constituted a blend of direct quotations from participants and a summarization of their discussion (Morgan 1997, p.64).

Discussion of Focus Group Findings

The participants were positive in their attitude toward the draft documents, and constructive with their suggestions for further refinement. In general, there were two types of changes identified during analysis of the focus group transcripts. First, there were themes which emerged in the transcripts. These included issues such as the importance of senior management involvement in BI evaluation and justification processes, evolutionary development of BI systems, and how this affected the types of benefits to be identified during evaluation. Also identified was the notion of maturity, and how the maturity of an organization adopting BI can affect the complexity of the systems put in place, and the potential benefits that may be gained. Secondly, further to the general themes raised, several detailed issues were identified. These issues were more specific to the structure and layout of the artefacts themselves, including formatting, turn of phrase, and the structure of the document.

The rich data obtained by the two sessions allowed the themes, along with specific changes, to be incorporated into the artefact. The changes to the documents meant that their strengths were clearer to the reader, and some minor errors and inconsistencies were removed. The semi-structured nature of the groups allowed participants to take the discussion in directions that were unanticipated by the researchers, but relevant to the research, and which ultimately improved the artefacts. Worth noting was the advantage that spontaneity brought to the sessions. The use of multiple participants in focus groups meant that participants only spoke when they felt that they had something useful to contribute. This meant that the transcripts contained very rich data, with little useless information. One on one interviews can sometimes produce variable quality data, because participants answer questions regardless of their level of contribution to the topic.

Guidelines for Focus Groups in Design Science Research

Drawing on the case example, other focus groups we have been involved with, and existing literature, this section identifies some guidelines for the use of focus groups in IS design science research. These guidelines can provide direction to fellow researchers considering adopting focus groups in their research. Our purpose for creating these guidelines is to support design science researchers in understanding the key requirements for implementing useful, effective, and valuable evaluation using focus groups. In keeping with Klein and Myers (1999) and Hevner et al. (2004), we do not propose the mandatory use of these guidelines, only that they be considered by researchers, who, using their own skill and judgment, assess how each may, or may not, be applied to their own research. The guidelines are summarized in Table 4, and are discussed in detail below. The example focus group discussed above met all four guidelines.

Guideline 1: Maintain Focus

By definition focus groups are not random discussions. They are not simply a group of people brought together to talk. They are a specific type of group exercise in terms of their purpose, structure, size, and procedures. Focus groups have a focused discussion (Krueger 1994, p.12). A key strength of focus groups research is the ability to produce concentrated amounts of data on exactly the topic of concern. This is a clear advantage over

participant observation. A researcher is able to target the focus of the discussion to a specific topic, whereas data collection for participant observation is less focused on a specific topic, and the focus can therefore drift. This makes focus groups an efficient method of data collection in comparison to individual.

The questions for focus groups should be clearly phrased, and sequenced to they are easily comprehended by participants. Open-ended questions are preferred. Questions appearing early in the sessions should be more general in nature, and be progressively more detailed as sessions progress. Early questions should get people talking and feeling comfortable. Questions towards the end of the sessions are of more importance and will yield the most valuable research data.

Guideline 2: Be Selective with Participants and Group Size

There are a number of considerations when selecting focus group participants. Participants are rarely selected using random sampling, and attention must be paid to the backgrounds of the potential participants, how they relate to the aims of the focus groups, and how they will interact with other participants. Power differentials between participants may cause friction, and affect the quality of the data being collected (Mitchell 1999). The composition of the group is central to group success; there must be an adequate level of diversity amongst participants, to encourage discussion, however too much diversity may cause conflicts (Bloor et al. 2002).

Theoretical sampling (Glaser & Strauss 1967; Patton 1990) or controlling the group composition to match specific categories of participants, is closely tied to an emphasis on homogeneity. Homogeneity within groups allows for free-flowing conversations among participants, and facilitates the analysis of differences of opinion.

Determining the size of the group is an important decision in focus group design, and is dependant on the resources available, and how much each participant has to contribute. If the chosen participants are highly involved with the research topic, they will have a lot to contribute. Conversely, groups consisting of those with little involvement in the research topic, will struggle for useful discussion. Deciding on group size is a balancing act; smaller groups have the benefit of hearing more from each participant, and work well when participants are interested in each others' opinion, although are more vulnerable to dynamics between individual participants. Larger groups can be more difficult to manage than small groups, as the chances of people speaking over one another increase, and participants may begin talking amongst themselves. It is wise to over-recruit to accommodate no-shows, 20 percent over as a rule (Morgan 1997). Traditionally, the recommended size for focus groups is 10 to 12 people (Krueger and Casey 2000), however this relates to traditional 'market research' style focus groups. More rigorous approaches from the social sciences often advise between six and eight participants as a good rule of thumb (Bloor et al. 2002). Ultimately, size will be dependant on the nature of the research, and level of participant involvement in the topic.

Guideline 3: Be Selective with Choice of Facilitator

The success of focus groups depends on useful responses from appropriate participants, answering the right questions. However, the focus group facilitator, or moderator, also plays a critical role in focus group studies. One common myth about focus groups is that facilitators require highly developed professional skills (Morgan & Krueger 1993). The choice of facilitator depends on a number of factors, it may be a hired professional facilitator, someone from the research group, a person within the organization with past focus group experience, or an inexperienced person wishing to facilitate for the first time. Although it is common to employ independent moderators in focus group research, particularly in marketing activities, in IS design science it preferable to use a researcher, because there is a need for the facilitator to have a detailed familiarity with the research objectives, and an intricate knowledge of the project (Morgan & Krueger 1993).

Guideline 4: Be Prepared

A critical aspect of focus group preparedness is establishing a rigorous theory base for the research. Like any research method, focus groups have their own relative strengths and weaknesses. Building focus group research upon a solid foundation of theory allows the researcher to effectively focus the group sessions, gather data in an effective manner, and analyse the data in the most suitable way. A thorough grounding in literature enables the researcher to plan their research in a way that embraces focus group strengths and mitigates their weaknesses.

A facilitator guide should be developed using Table 3 as a guide. The facilitator and researchers should review its content and suggest changes to make it consistent with the overall aims of the sessions. It is difficult for a facilitator to achieve the objectives of the research if the guide has not been jointly developed (Greenbaum 1993).

Detailed planning for the day is crucial. The artefact materials should be given to participants more than a week before the focus groups, to allow sufficient preparation time. Extra copies of the draft artefact should be available on the day and technology fail-safes available in the event of malfunction. This includes multiple video

cameras and handheld audio recording devices. Before the focus group sessions the technical setup of the facility should be tested.

An assistant should greet participants on arrival, and brief those who arrive late. Allow participants time prior to the beginning of the first session to get to know each other. Nameplates should be on the meeting table for the convenience of the participants and facilitator.

Guideline 5: Allow Flexibility

Flexibility in the conduct of focus groups allows for idiosyncratic, evolutionary data gathering. The facilitator guide is just that, a guide (Stewart and Shamdasani 1990) and should reflect the adaptability of the focus group environment. Rather than a rigid set of specific questions for the guide, a more flexible format permits open-ended questions and allows participants to take the flow of the conversation in a direction where they feel most appropriate. Unlike other formal group processes focus groups are dynamic exercises and their success can depend on the ability of the facilitator to pursue new, unexpected questions. The facilitator should be allowed to improvise questions or comments as they see fit, within the boundaries of the facilitator guide (Knodel 1993).

Guideline 6: Take a Pragmatic Approach to Analysis

Analysis should start by revisiting the purpose of the study. Once a detailed transcription of the focus group data has been completed, the amount of data can be daunting. The level of analysis that should take place should be determined by the purpose of the sessions. If the purpose of the study is quite narrow, then complex analysis of the data may not be necessary. Alternatively, if the scope is broad, then more complex methods of analyses are appropriate. Disparities with the analysis method and the purpose of the focus group sessions may result in unusable results. The potential risk is over-analyzing insignificant data, or inadequate analysis of useful data.

Kruegar (1994) notes that transcription is not always necessary and that in some cases there are sufficient amounts of data to be gained on the basis of listening during the sessions, or thorough the notes made by the facilitator. Focus group analysis can take many forms (see Coffey and Atkinson (1996)). When there are multiple transcripts for analysis, or a substantial amount of data, it might be more convenient to use one of the many computer-based qualitative data analysis packages.

Table 4: Guidelines for Focus Groups in Design Science Research

Guideline	Description
Guideline 1: Maintain Focus.	Focus groups are not random discussions, they can solicit concentrated amount of focused data. Stay on track, plan questions carefully.
Guideline 2: Be Selective with Participants and group size.	Participants are rarely selected randomly. Avoid power differentials between participants. There must be a suitable level of diversity to encourage discussion, however too much will cause conflict amongst participants. Group size will be dictated by the research focus, participant availability, and level of participant involvement in the topic. Six to eight is a good starting point, but accommodate no-shows.
Guideline 3: Be Selective with Facilitator.	Choose a facilitator familiar with the research area, particularly if it's specialized. They should be personable, and be able to think on their feet. They should guide the group, not control it.
Guideline 4: Be Prepared.	Carefully plan the facilitator guide, early effort will improve data collection through focused questions. Send any documents early, have spare copies ready on the day. Use fail-safes when technology is involved. Using assistants reduces the researcher's workload, allowing them to focus on key matters. Be familiar with the literature on focus groups, learn from the mistakes of others.
Guideline 5: Allow Flexibility.	Adapt to change, allow participants to take discussion in useful directions, the facilitator guide should allow for this. Pursue unanticipated questions or comments. Remove questions already covered between groups.
Guideline 6: Take a Pragmatic Approach to Analysis.	Choose a suitable analysis method. Ensure the analysis approach enables effective data capture, and data is not under-analyzed. Encourage observers to take notes during the sessions. Non-verbal data can be useful, such as laughter, direction of conversation, and facial gestures; video recording sessions aids this.

Conclusion

This paper has addressed the role of focus groups in IS design science research. It discussed the importance of design science in information systems research, identified the fundamentals of a design science methodology, and illuminated the importance of evaluating design science artefacts. It provided background to the development of the focus group approach and its use as a qualitative research technique. The paper argued that focus groups can be used as an effective evaluation method in design science research, and provided an in-depth example of a successful implementation of focus groups in such a research environment. The paper also provided several guidelines for the use of focus groups in design research, which aim to support those considering, or currently using, focus group research methods. The key purpose of this paper has been to

propose focus groups as a useful method for evaluating design science artefacts, and that they should be incorporated into the existing literature on techniques for assessing the utility, quality and efficacy of design artefacts. In doing so, researchers will be better equipped to create useful design artefacts, which address challenging circumstances, and solve organizational problems. We believe that focus groups, rigorously designed and conducted, are a very valuable evaluation method for IS research.

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