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This is an author produced version of a paper published in

Proceedings of The 12th European Conference on Research Methodology
for Business and Management Studies ECRM-2013 (ISBN
9781909507303)

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Citation Details

Citation for the version of the work held in 'OpenAIR@RGU':

MARCELLA, R., LOCKERBIE, H. and BAXTER, G., 2013. Critical
incident technique as a tool for gathering data as part of a
qualitative study of information seeking behaviour. Available from
OpenAIR@RGU. [online]. Available from: <http://openair.rgu.ac.uk>

Citation for the publisher's version:

MARCELLA, R., LOCKERBIE, H. and BAXTER, G., 2013. Critical
incident technique as a tool for gathering data as part of a
qualitative study of information seeking behaviour. In: I. RAMOS
and A. MESQUITA (eds.) Proceedings of The 12th European
Conference on Research Methodology for Business and
Management Studies ECRM-2013. 4-5 July 2013. Sonning
Common: Academic Conferences and Publishing Limited. Pp. 247-
253.

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The critical incident technique as a tool for gathering data as part of a qualitative study of information seeking behaviour

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Abstract: Since devised by Flanagan in 1954 as a tool to explore what people do to achieve an organisational aim, the critical incident technique (CIT) has been used in various disciplines as a method of understanding human behaviour. This paper provides an overview of the use of CIT in the specific field of information behaviour, both in large-scale quantitative studies designed to assess the quality and impact of library and information systems and services, and in more qualitative research examining the information needs and use of particular professions or occupational groups, or of particular societal or community groups. It highlights the inconsistent application of CIT in academic research, and the quantitative versus qualitative tension that exists in discussions of the use of CIT as a data collection tool. The paper also discusses the use of CIT by the authors in a study of the information seeking behaviour of oil and gas professionals in a health and safety context, considering that project in relation to Flanagan's five main steps in the CIT process, and in terms of the benefits and limitations of the technique identified by Flanagan and by other commentators. The authors believe that CIT has particular advantages in the study of information behaviour as a method of illuminating the ways in which the context of information need impacts on information behaviour, how participants feel, and in particular in identifying positive and negative behaviours in information seeking and use. The authors also argue that CIT must be used in a thoughtful manner and in a full recognition of its weaknesses in the design of future research.

Keywords: critical incident technique, information behaviour, qualitative techniques

1. Introduction

The critical incident technique (hereafter CIT) has its roots in the Aviation Psychology Program of the US Army Air Forces during World War II, where it was used in the selection and classification of aircrews. Almost ten years after the war, one of the psychologists involved in the programme, John C. Flanagan, wrote a now famous paper on the development of the methodology and its subsequent use in a number of studies exploring the critical requirements for specific occupational groups or activities (Flanagan 1954). In his paper, Flanagan (p.327) defined CIT as consisting of "a set of procedures for collecting direct observations of human behavior in such a way as to facilitate their potential usefulness in solving practical problems and developing broad psychological principles". For an incident to be critical, Flanagan argued (p.327), it "must occur in a situation where the purpose or intent of the act seems fairly clear to the observer and where its consequences are sufficiently definite to leave little doubt concerning its effects".

While Flanagan's paper placed a clear emphasis on data collection through the direct observation of human behaviour by trained observers, he acknowledged that, "if suitable precautions are taken, recalled incidents can be relied on to provide adequate data..." (p.340). Indeed, he was at pains to point out that the technique "does not consist of a single rigid set of rules governing such data collection. Rather it should be thought of as a flexible set of principles which must be modified and adapted to meet the specific situation at hand" (p.335). Flanagan suggested that four procedures could be used in collecting recalled data in the form of critical incidents: individual interviews; group interviews; questionnaires; and/or "record forms" (i.e. where the participants record details of critical

incidents in narrative form, or where they place a 'check' or 'tick' in the appropriate place on a pre-determined list of the most likely incidents to occur).

In 2005, in a paper celebrating 50 years of CIT, Butterfield et al. (2005) championed both this flexibility and the subsequent diversity of disciplinary application. They noted that the technique has been utilised across a wide range of subject areas, including counselling, education and teaching, marketing, medicine, nursing and social work. They also concluded, however, that the CIT's flexibility has become something of a "double-edged sword", as it has "encouraged the proliferation of approaches and terminology" (p. 476). For example, they catalogue several studies in which the data analysis procedures have diverged from those outlined by Flanagan (Butterfield et al. 2005, p.481); and, to highlight terminological inconsistencies, they list a number of phrases used in studies adopting CIT, including 'critical event technique', 'critical incident exercise' and 'critical incident reflection' (p. 476).

This current paper discusses the use of CIT as a methodology in the domain of library and information science (LIS), and more specifically in the field of information behaviour. It will provide an overview of some of the published studies in this area, before focusing on a recent project, conducted by the authors, which used CIT to explore the information seeking behaviour of oil and gas professionals in a health and safety context.

2. CIT use in information behaviour studies

As Urquhart (2001) explains, the use of the critical incident technique in information behaviour research has tended to revolve around the examination of "a brief, but memorable information seeking episode", where the researchers have asked participants to provide one or more examples of occasions when they have sought information in order to, say, solve a problem or make a decision, to discuss the methods used in acquiring the information, and to evaluate the value and impact of the information obtained.

A number of these studies have been large-scale, questionnaire-based exercises, designed largely to assess the quality and impact of library and information systems and services. For example, Radford (2006) explored young people's perceptions of public librarians and library staff in New York City, by gathering details of both "good" and "unpleasant or bad" experiences in public libraries from over 2,400 fifth and seventh grade students. Also in New York, Small and Snyder (2009), in a study of the impact of school libraries on student achievement and motivation, used an "open-ended critical incident probe" to ask respondents to reflect on a particular event or activity in which the school library "helped or excited students about learning something new". Tenopir, meanwhile, has been part of a team that has written a series of papers on academic faculty's readership of scholarly articles (e.g. Tenopir, King and Bush, 2004; Tenopir et al., 2009; Tenopir, 2012). Here, they have used a variation of CIT, which they term the "incident of last reading", in order to both assess information-seeking and reading patterns, and demonstrate the value of libraries' journal collections. Urquhart et al. (2003, p.76) highlight the problems associated with a self-completion questionnaire approach, where "respondents...despite instructions supplied, had answered the questionnaire in general terms, giving details about what they usually did...rather than detailing what happened on one particular incident". Conversely, Serenko and Turel (2010) describe the successful use of CIT in a paper-based survey of Canadian university students' positive and negative incidents relating to email usage, citing as benefits of CIT that novel descriptions of previously unrecorded phenomena may be generated.

Of greater interest to the present authors is the use of CIT in more qualitative information behaviour studies, where the technique has been integrated into interview instruments. Of the studies discussed in the literature, several focus on particular professions or occupational groups, frequently in the healthcare professions. Indeed, Urquhart et al. (2003, pp. 72-74) provide a tabular overview of CIT studies in the health sector, conducted between 1983 and 2001. More recently, the information behaviour of health professions has been the subject of CIT-based research ranging from Musoke's 2007 study of the accessibility and use of health information among primary healthcare providers in rural Uganda, to the investigation of the information challenges facing non-clinical managers in rural Nova Scotia, Canada, by MacDonald et al. (2011). The academic community, too, has been the

subject of a number of qualitative CIT studies, aided presumably by the relative convenience of research participants. These have included studies of academic staff, such as Jamali and Asadi's 2010 exploration of the role of Google in the information seeking behaviour of physicists and astronomers, and Makri and Blandford's examination, in 2012, of the ways in which interdisciplinary researchers come across information serendipitously. They have also included student-focused projects, such as the research conducted by Kerins et al. (2004) which explored the information behaviour of engineering and law students in Ireland, where the critical incident focused on their final year project.

Elsewhere, CIT has been used as the basis for interviews in a range of occupational information behaviour studies conducted internationally, from the examination of artisan fisher folk in Uganda (Ikoja-Odongo and Ocholla, 2003), to Zach's 2005 study of how senior arts administrators in the US decide when they have found "enough" information to complete management tasks. And from Lambert's 2010 study of how Southern Baptist ministers in the midwestern US obtain information for administrative or pastoral purposes, to the investigation of the ways in which Kuwaiti journalists seek information for journalistic assignments (Chaudry and Al-Sagheer, 2011).

Away from the workplace environment, a number of information behaviour researchers have used CIT within the framework of everyday life information seeking (ELIS), which Savolainen (1995, pp 266-7) defined as "the acquisition of various informational (both cognitive and expressive) elements which people employ to orient themselves in daily life or to solve problems not directly connected with the performance of occupational tasks". Some of this research has attempted to look at a broad cross-section of a particular community, including Savolainen's own study (1995) of the residents of Tampere, Finland; and Johnson's (2004) investigation of the role of social networks and social capital in the information seeking behaviour of the residents of Ulaanbaatar, Mongolia. Other studies have focused on particular societal groups, or on individuals at particular stages of the life cycle. For example, Jiyane and Ocholla (2004) studied the information needs and sources of women in a rural community in South Africa, while Hamer (2003) used CIT interviews with young gay men to acquire data on their information behaviour relating to coming out. Julien (1999) explored the barriers that Canadian adolescents face in accessing information helpful for career decision making; while Niemelä and Huotari (2008) investigated the information use of Finnish senior citizens.

While Davenport (2010), in a review of the use of three "confessional methods" in ELIS research, describes CIT as a "fitting technique for analyzing...confessional phenomena", and argues that the confessional approach is particularly apposite for ELIS, she is critical of the ways in which CIT has actually been used in the ELIS field. In particular, she notes that the number of critical incidents required for "robust analysis" is rarely achieved, that few researchers comply with Flanagan's protocols, and that his caveats are "rarely discussed, let alone heeded" (p. 539). However, this charge could equally be levelled at the use of CIT in other social science research (Butterfield et al. 2005, p.476). Urquhart et al. (2003, p. 65) are also critical of the lack of methodological detail in the published accounts of many CIT studies.

Bearing these points in mind, the following section of this paper will discuss the present authors' use of CIT to explore information behaviour in an oil and gas, health and safety context. Although it should be emphasised here that, in designing the study, the researchers did not have Flanagan's protocols in mind. Rather, they drew upon some of their previous, interview-based, information behaviour research in which participants focused on recent information-seeking incidents or episodes. For example, Marcella and Illingworth (2012) used such an approach when studying the information behaviour of UK entrepreneurs encountering business failure; while Baxter, Marcella and Illingworth (2010), in exploring organisational information behaviour during Scottish Government public consultation exercises, asked interviewees to consider the example of the most recent consultation to which they had responded. While the current authors did not, themselves, adhere rigidly to Flanagan's guidance, they will consider their research in relation to his five main steps in the CIT process, and in terms of the benefits and limitations of CIT identified by Flanagan and by other commentators.

3. The use of CIT as a tool to gather data about information behaviour in the oil and gas industry

The study which provided the basis for this paper and reflections on the use of CIT as a data collection method was conducted in 2011 and was sponsored by an engineering software provider, focusing on the oil and gas sector. The study explored the role of information systems in enhancing health, safety and emergency response in the oil and gas industry and gathered useful perspectives on the role of information systems in enhancing health and safety management. The study also uncovered insights into the information seeking behaviour of oil and gas professionals in a health and safety context. The project was particularly timely in that it took place when the critical nature of health and safety in the energy sector continued to receive considerable attention internationally, particularly following the high-profile Deepwater Horizon disaster in 2010. Indeed, a commission appointed by President Obama to investigate the Gulf of Mexico explosion and oil spill concluded that “most, if not all, of the failures at Macondo can be traced back to underlying failures of management and communication” (National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling, 2011, p.122). The research described here coincided with that discussed in the only other known published paper on CIT-based information behaviour research in the energy sector, where Ibrahim and Allen (2012) explored the relationship between information sharing and trust during major incidents in the oil industry, interviewing 19 employees of a major multinational oil company in the process.

The present authors’ study was undertaken in two distinct stages, in a mix of quantitative and qualitative approaches: 1) an online questionnaire survey of over 370 individuals in the oil and gas industry, completed largely by health and safety managers, senior managers and engineers located across the globe; and 2) a series of in-depth interviews utilising critical incidents as a focus. It is the second stage of the project which forms the basis of the discussion below, relating this to Flanagan’s five key steps in the CIT process.

Understanding the general aims of the activity being studied. Flanagan (1954, p. 336) notes that a basic condition for any use of CIT is a “fundamental orientation in terms of the general aims of the activity” being studied. The main focus of this study was, of course, the role of information systems and information behaviour in enhancing health and safety in the oil and gas industry. The present authors have an extensive background in LIS research, and, through a number of other recent research projects commissioned by industry, have developed a sound knowledge of health and safety management in the energy sector. Of critical importance here, though, was the input of the commissioning company. All survey questions and interview schedules were designed in consultation with the research sponsors, to reflect industry perspectives. On reflection, while the process of collaborative research design can be challenging, with industry-led research focusing on broad lessons, and academic research focusing on the ‘small detail’, such an approach was felt to be an effective exercise in ensuring that the research instruments were well designed.

Making plans and setting specifications. As the second stage of the CIT process, Flanagan (1954, pp. 337-339) called for researchers to set precise plans and specifications. He urged that the types of situations to be explored – the critical incidents – should be relevant and clearly defined, and that those conducting the research should be familiar with the types of incident being studied and be consistent in their approach. In the current study, the critical incidents to be discussed in the interviews were all pre-determined by the participating businesses from the oil and gas sector, with agreement from the research team. While the incidents could be chosen by the organisations, they had to meet two basic criteria: 1) that any incident be substantial enough in nature that the information aspects of dealing with the situation might be explored fully in the CIT interview; and 2) that they be significant enough to have caused potential detrimental impact to the organisation, but not sufficiently high profile to jeopardise participant anonymity. To ensure consistency of approach, the interviews were all conducted by the same member of the research team. Flanagan (1954, p. 341) also highlighted the need to “try out” questions with a small group of typical participants before being put into general use in a study. However, as Urquhart et al. (2003, p. 65) point out, many published CIT studies fail to provide any details on how, or indeed if, such piloting was conducted. In this research, to ensure the effectiveness of the interview instrument, the interviewer first conducted pilot interviews with three individuals with experience of working either in the oil and gas industry or in a health and safety role.

Collecting the data. Flanagan (1954, p. 343) noted that sample size in CIT studies is determined less by the number of participants involved, than by the number of critical incidents (and associated “critical behaviors”) observed or reported, and whether or not these adequately represent the activities being studied. While he noted that “there does not appear to be a simple answer to this question”, he discussed samples in terms of hundreds or thousands of incidents. Davenport (2010, p. 538), observes that these numbers are rarely met in information behaviour research, but fails to acknowledge the resource levels required to conduct CIT research on such a scale. Urquhart et al. (2003, p. 65), on the other hand, note that “few studies can afford [that] level of research effort”. Certainly, in industry-sponsored projects such as that described here, researchers rarely have the luxury of the time and financial resources necessary to gather samples of that size.

The CIT element of the study discussed here was based on just four critical incidents, one identified by each of four participating companies. Enlisting organisational participants proved difficult, largely due to the subject nature of the research. Understandably, businesses were cautious about openly discussing incidents that might be considered embarrassing and commercially sensitive. This problem was, presumably, also encountered by Ibrahim and Allen (2012) in their research, as they note that they had a signed confidentiality agreement with the participating oil production company. The four businesses participating in this study were recruited via the online survey, the online professional networking site, *LinkedIn*, or via the researchers’ industry contacts. The four companies consisted of an operator, a contractor, a manufacturer, and a logistics company; although this range of business types was achieved more by accident than design. The four critical incidents on which the interviews were based were, respectively:

- the 2010 Icelandic ash cloud and its effects on the safe transportation of staff between onshore and offshore installations, which was considered potentially detrimental to business performance;
- a software failure, resulting in the loss of data with health and safety implications;
- the potential contamination of thousands of pockets of private land, due to industrial and domestic fuel container leakage; and
- a chemical spillage following a traffic accident at a major city road junction.

The duration of these four events ranged from one week to around eight years, and interviews were sought from key individuals instrumental in dealing with the incidents and their aftermaths, and who were thus able to comment critically on the impact that information behaviour had had on their company’s capacity to respond. Interviews were conducted with eleven individuals from across the four companies, either face-to-face or by telephone. The research team had also sought participation from employees from a range of hierarchical levels, to reflect the differing perspectives within a response team dealing with a critical incident. As a result, the interviewees occupied a variety of roles, including investigator, supervisor, lead response, safety advisor, duty manager and data analyst.

All interviewees were given advance notice of the critical incident to be discussed, although the precise nature of the interview questions was not revealed prior to the interviews taking place. As Flanagan (1954, p. 339) rightly advises, recalled critical incidents are best recorded “while the facts are still fresh in the mind”. While three of the four incidents had occurred in the 12 months prior to the interviews taking place, the fourth incident (that of the fuel container leakage) had been a lengthy affair first identified in 2001, ten years before this research took place. Despite this time lapse, there was little evidence of any significant deviance between the basic accounts of the individuals involved in that incident. And while the researchers acknowledge that respondents from within particular companies, having had prior notification of the critical incident to be explored, would have had the opportunity to consult company documentation on the incident, or to discuss it with their colleagues, there was no obvious evidence of any ‘collusion’ having taken place in an attempt to provide consistent accounts. With one incident, the company concerned also provided a copy of their internal report on the event, further verifying their employees’ verbal accounts.

All interviewees talked freely and at length about the incidents and their associated information behaviours. The researchers believe that the use of CIT gave focus to the interviews, allowing open discourse on a familiar topic, and enabling participants to describe information seeking behaviour without a need for a deep understanding or interest in the information domain on a conceptual level. Sharoff (2008) warns that participant embellishment might occur during CIT; however, the current

authors feel that such embellishment will occur naturally and is not a factor which can be excluded from any study.

Analysing the data. The CIT interviews lasted between 40 and 120 minutes, were recorded with permission, and were subsequently transcribed verbatim. Flanagan describes the analysis of critical incident data as involving three distinct elements: determining a general frame of reference that will be useful for describing the critical incidents; inductively constructing a set of categories for the incidents; and deciding on the most appropriate level of specificity-generality with which to report the data. In the present study, the transcripts were analysed with recurring themes being coded in an iterative process.

Interpreting and reporting the results. Flanagan (1954, p. 345) warns that the “real errors” in CIT “are made not in the collection and analysis of the data but in the failure to interpret them properly”, while both Urquhart et al. (2003) and Radford (2006) highlight the difficulty of coder interreliability. In this study, the interview transcripts were independently analysed by two members of the research team to add reliability to the interpretation of the data.

4. Conclusions

This paper has provided an overview of the use of CIT in the study of information behaviour, and has discussed its specific use in an exploration of the information seeking behaviour of oil and gas professionals in a health and safety context. It has shown that the inconsistent application of the technique has been highlighted by various observers as a weakness of CIT-based studies. However, in line with Flanagan’s belief in the importance of flexibility and freedom from constraint, the current authors believe that it is the critical insight with which the study is designed that is important, and that it is only by testing research tools in an open and exploratory way that their true contribution can be evaluated. There also remains a quantitative versus qualitative tension in discussions of the use of CIT as a data collection tool. The major challenge, however, is that researchers must position their research appropriately within a research domain and not try to apply empiricist approaches to qualitative studies and vice versa. The present authors view their use of CIT as a technique in a classic qualitative tradition.

As with the use of any methodology, the CIT has strengths and weaknesses. However, the authors believe that it has particular advantages in the study of information behaviour as a method of illuminating the ways in which the context of information need impacts on information behaviour, how participants feel and in particular in identifying positive and negative behaviours in information seeking and use, which would merit further exploration. The authors would also argue that CIT must be used in a thoughtful manner and in a full recognition of its weaknesses in the design of future research. Flanagan’s original conception of the CIT to better understand human behaviour in the course of achieving an aim is fundamental to information behaviour research and his design of the CIT process recognised the need for flexible evolution of the tool. It is hoped that a body of work extending this understanding of its contribution to information behaviour research will continue to evolve.

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