The Research Audit Trial – Enhancing Trustworthiness in Qualitative Inquiry

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Abstract: Positivist and interpretivist researchers have different views on how their research outcomes may be evaluated. The issues of validity, reliability and generalisability, used in evaluating positivist studies, are regarded of relatively little significance by many qualitative researchers for judging the merits of their interpretive investigations. In confirming the research, those three canons need at least to be re-conceptualised in order to reflect the keys issues of concern for interpretivists. Some interpretivists address alternative issues such as credibility, dependability and transferability when determining the trustworthiness of their qualitative investigations. A strategy proposed by several authors for establishing the trustworthiness of the qualitative inquiry is the development of a research audit trail. The audit trail enables readers to trace through a researcher's logic and determine whether the study's findings may be relied upon as a platform for further enquiry. While recommended in theory, this strategy is rarely implemented in practice. This paper examines the role of the research audit trail in improving the trustworthiness of qualitative research. Further, it documents the development of an audit trail for an empirical qualitative research study that centred on an interpretive evaluation of a new Information and Communication Technology (ICT) student administrative system in the tertiary education sector in the Republic of Ireland. This research study examined the impact of system introduction across five Institutes of Technology (IoTs) through case study research that incorporated multiple evidence sources. The evidence collected was analysed using a grounded theory method, which was supported by qualitative data analysis software. The key concepts and categories that emerged from this process were synthesized into a cross case primary narrative; through reflection the primary narrative was reduced to a higher order narrative that presented the principle findings or key research themes. From this higher order narrative a theoretical conjecture was distilled. Both a physical and intellectual audit trail for this study are presented in this paper. The physical audit trail documents all keys stages of a research study and reflects the key research methodology decisions. The intellectual audit trail, on the other hand, outlines how a researcher's thinking evolved throughout all phases of the study. Hence, these audit trails make transparent the key decisions taken throughout the research process. The paper concludes by discussing the value of this audit trail process in confirming a qualitative study's findings.

Keywords: interpretivist paradigm, qualitative research, research audit trail, research confirmability, trustworthiness, transferability, information technology, higher education

1. Introduction

The research study discussed in this paper is centred on the field of ICT evaluation. Positivist approaches have dominated past ICT research. These approaches emphasise the quantification of expected ICT system impacts, in order to reduce a potential investment to a "yes"/"no" decision. However, they are regarded as inappropriate by many authors, as the focus on positivist evaluation approaches has failed to resolve many ICT evaluation concerns (Irani and Love, 2001; Hughes and Jones, 2003). On the other hand, the interpretivist paradigm offers the opportunity to develop an in-depth understanding of an ICT system's impact, as it facilitates the capture of contextual depth and detailed, nuanced descriptions. This is a more appropriate approach to ICT evaluation as it recognises the social and organisational contexts and avoids the unproblematic, value-free view of organisations associated with positivist approaches.

The interpretivist research paradigm emphasises qualitative research methods, which are flexible, context sensitive and largely concerned with understanding complex issues. Researchers widely debate how the trustworthiness of interpretivist research efforts is evaluated. Positivist researchers, who emphasise the issues of validity, reliability and generalisability, often regard qualitative research methods as unscientific. Several researchers suggest new criteria for evaluating qualitative enquiry (Lincoln and Guba, 1985; Leininger, 1994) and many different approaches to evaluating qualitative research have been discussed in the literature. This paper explores in depth the standards for evaluating qualitative inquiry. It considers how the canons of validity, reliability and generalisability can be used for evaluating qualitative research by reconceptualising these standards to reflect the key issues of concern for interpretivist researchers. The paper examines the role of the research audit trail, which is a strategy recommended by several authors for assessing the trustworthiness of qualitative studies. Further, the paper documents the development of a research audit trail for an

Reference this paper as:
Carcary, M. "The Research Audit Trial – Enhancing Trustworthiness in Qualitative Inquiry." *The Electronic Journal of Business Research Methods Volume 7 Issue 1 2009, (pp.11 - 24), available online at www.ejbrm.com*

empirical qualitative research study in the field of ICT evaluation, and examines its value in confirming qualitative research findings.

2. Exploring the interpretivist paradigm

Interpretivism has grown in importance in IS research in the past decade (Walsham, 2006). In the interpretivist paradigm, the researcher is not perceived as being entirely objective; rather he/she is a part of the research process (Rowland, 2005). According to Walsham (2006: 321):

> *"we are biased by our own background, knowledge and prejudices to see things in certain ways and not others".*

Further, Wheatley (1992: 7) stated:

> *"we inhabit a world that is always subjective ... Our world is impossible to pin down, constantly and infinitely more interesting than we ever imagined".*

The interpretivist stance is holistic and considers numerous variables including the context of the study (Klein and Myers, 1999). Context is regarded critical. As outlined by Clarkson (1989: 16):

> *"people cannot be understood outside of the context of their ongoing relationships with other people or separate from their interconnectedness with the world".*

Hence, this approach aims to grasp the diversity of subjects' experiences (Kvale, 1996).

Interpretivism recognises the difficulty in making research value-free and objective. In terms of this view, a single objective reality does not exist. The social world does not lend itself to being understood by physical-law-like rules (Snape and Spencer, 2003). Multiple realities need to be considered. These include an external reality, which is what actually occurred in the physical world, and internal realities, which are subjective and unique to each individual (Bannister, 2005). Because each situation is different, the researcher needs to delve below the surface of its details to understand the reality. The meaning derived by the researcher is a function of the circumstances, the people involved and the broad interrelationships in the situations being researched (Saunders et al, 2007; Ticehurst and Veal, 2000). Walsham (2006: 325) maintained that:

> *"the researcher's best tool for analysis is his or her own mind, supplemented by the minds of others when work and ideas are exposed to them".*

Unlike the positivist stance, physical-law-like generalisations are not the end product. Rather understanding through detailed descriptions is sought by answering questions such as "*what*?", "*why*?" and "*how*?"

3. Qualitative research methods

The interpretivist paradigm emphasises qualitative research methods where words and pictures as opposed to numbers are used to describe situations. According to Van Maanen (1983: 9) qualitative methods include:

> *"an array of interpretive techniques which seek to describe, decode, translate, and otherwise come to terms with the meaning, not the frequency, of certain more or less naturally occurring phenomena in the social world".*

In qualitative research, the researcher is actively involved and attempts to understand and explain social phenomena in order to solve what Mason (2002:18) calls "*the intellectual puzzle*". It relies on logical inference (Hinton et al, 2003) and is sensitive to the human situation as it involves dialogue with informants (Kvale, 1996). In general, the researcher collects large quantities of detailed evidence. Thus, qualitative research may achieve depth and breadth (Blaxter et al, 1996; Snape and Spencer, 2003; Ticehurst and Veal, 2000). Further, qualitative methods are useful when the researcher focuses on the dynamics of the process and requires a deeper understanding of behaviour and the meaning and context of complex phenomena (Alvesson and Sköldberg, 2000; Snape and Spencer, 2003). It is the most appropriate approach for studying a wide range of social dimensions, while maintaining contextual focus (Mason, 2002).

Conducting qualitative research requires considerable reflection on the researcher's part, and the ability to make a critical assessment of informants' comments. It involves debating the reasons for adopting a course of action, challenging ones own assumptions and recognising how decisions shape the research study. Mason (2002) provided the following guidelines for the qualitative researcher:

- The research should be conducted systematically and rigorously;
- It should be strategic, flexible and contextual;
- The researcher is accountable for its quality and claims;
- He/She should engage in critical scrutiny or active reflexivity;
- He/She should produce convincing arguments.

As outlined, positivist researchers often regard qualitative research methods as unscientific. However, Kvale (1996) challenges this assumption stating that it reflects a limited view of science. Rather science needs to be regarded as a subject of continuous clarification and discussion.

Qualitative data collection approaches include for example participant observation, observation, documentary analysis, discourse analysis, conversation analysis, biographical methods, case studies, interviews and focus group discussions (Ritchie, 2003). The choice of method is influenced by the nature of the research problem, the researcher's theoretical lens or philosophical assumptions, the researcher's skills and academic politics (Trauth, 2001).

The challenge for many qualitative researchers lies in analysing the body of evidence gathered so as to produce a convincing explanation of the phenomena, based on a holistic interpretation of the social understandings captured in the empirical data. The difficulty lies in the fact that the researcher is:

> *"faced with a bank of qualitative data [and] has very few guidelines for protection against self delusion, let alone the presentation of unreliable or invalid conclusions to scientific or policy making audiences. How can we be sure that an "earthy", "undeniable", "serendipitous" finding is not, in fact wrong" (Miles and Huberman, 1994).*

Kvale (1996: 32) suggested that:

> *"precision in description and stringency in meaning interpretation correspond in qualitative interviews to exactness in quantitative measurements",*

while Miles and Huberman (1994) stated that:

> *"the strengths of qualitative data rest very centrally on the competence with which their analysis is carried out".*

Data analysis is an iterative process and requires what Alvesson and Sköldberg (2000: 248) termed "*reflexive interpretation*". This is a need for reflection and interpretation on several levels. Reflection requires thinking about the research and as outlined by Alvesson and Sköldberg (2000: 245), it involves examining how:

> *"the theoretical, cultural and political context of individual and intellectual involvement affects interaction with whatever is being researched".*

Interpretation takes place on four levels:

- Interaction with the empirical material;
- Interpretation of underlying meanings;
- Critical interpretation;
- Reflection on text production and language use.

Interpretation suggests that there are no clear rules and that the researcher's judgment, intuition and ability to highlight issues play an important part in the process.

4. Evaluating qualitative research

Because of the role of researcher judgement and intuition, and potential for researcher bias in interpretivist research, the question as to how the trustworthiness of qualitative research findings can be demonstrated has received much attention in the literature. Miles and Huberman (1994) stated:

> *"Still the problem of confidence in findings has not gone away…We need to keep working at sensible canons for qualitative data analysis, in the sense of shared ground rules for drawing conclusions and verifying their sturdiness".*

When evaluating their research efforts, positivist researchers place significant emphasis on the issues of validity, reliability and generalisability. Kvale (1996: 229) suggests that these standards have

acquired the status of a "*scientific holy trinity*" among the positivist research community. However, they are regarded of relatively little significance by many qualitative researchers (Kvale, 1996; Marshall and Rossman, 1995; Mason, 2002). Strauss and Corbin (1998: 266) suggests that these canons need to be redefined in order to:

> *"fit the realities of qualitative research and the complexities of the social phenomena that we seek to understand".*

Some authors maintain that these standards are pertinent only to the positivist paradigm (Leininger, 1994). Others suggest adopting new criteria for evaluating qualitative inquiry (Lincoln and Guba, 1985; Leininger, 1994). For example, Lincoln and Guba (1985) consider the credibility, dependability, transferability, authenticity and confirmability of qualitative studies.

The principal issues for interpretivists are consistency and integrity in the study's design. Qualitative researchers emphasise the importance of reflecting on the body of evidence, the ability to make critical assessments of informants' statements, and the importance of producing convincing arguments and explanations (Mason, 2002). Many different approaches to evaluating qualitative research have been discussed in the literature. However, the author maintains that the canons of validity, reliability and generalisability can be used in evaluating qualitative research. However these standards need to be reconceptualised to reflect the key issues of concern for interpretivist researchers.

5. Validity

From an interpretivist's perspective, validity refers to how well the research method investigates what it intends to (Lewis and Ritchie, 2003; Mason, 2002) and the extent to which the researcher gained full access to informants knowledge and meaning (Remenyi et al, 1998). Some qualitative researchers discuss the issue of validity in terms of their research authenticity; in other words the issue of validity is rooted in the philosophical contexts of the study's research model and its fundamental assumptions (Lincoln, 2001). The important issue in qualitative research is achieving a congruence of understanding between the informant and the researcher (Lewis and Ritchie, 2003) and in ensuring the research is credible. This involves demonstrating that the research design accurately identified and described the phenomenon under investigation. A number of authors suggest strategies to enhance the validity of qualitative studies.

For example, Mason (2002) discusses the need to demonstrate the validity of data generation and the validity of the researcher's interpretations. Validity of data generation is concerned with how appropriate a specific research method is for answering the research questions and providing explanations. On the other hand, validity of interpretation is concerned with how convincing the data analysis process and the researcher's interpretations are. This is contingent on the validity of the research method especially the approaches taken in data analysis and the transparency of the researcher's interpretations.

Lewis and Ritchie (2003) suggest that it is useful to consider the qualitative study's internal and external validity. Internal validation is enhanced by adopting a constant comparative method and recognising the importance of deviant cases in acquiring a greater understanding for theory development. External validation is improved through triangulation and respondent validation.

6. Reliability

Reliability is largely concerned with whether a study can be repeated (Kvale, 1996; Lee and Baskerville, 2003; Mason, 2002; Yin, 2003). In the traditional natural and life sciences, reliability is an issue of considerable importance. However, qualitative researchers recognise the difficulty in reproducing social phenomena because of the challenges involved in replicating the precise conditions under which evidence was originally collected (Strauss and Corbin, 1998). Even if the same informants participated in a later similar study, it is unlikely they would provide identical responses. This is because having reflected on the initial research process, their understanding of the key issues may have further developed or changed. However, if similar studies were conducted with considerable care, one would anticipate that the findings would not be entirely different. Hence, the issue of reliability needs to be conceptualised differently when considering qualitative studies.

From an interpretivist's perspective, reliability is concerned with demonstrating that the researcher has not invented or misrepresented data or been careless in data recording or analysis (Mason,

2002). Lewis and Ritchie (2003) suggest that the researcher can enhance reliability by reflecting on and outlining in a transparent way the procedures that led to the research findings; by checking through his/her interpretations; by carrying out the fieldwork consistently and ensuring all informants have sufficient opportunity to discuss their experiences; by systematically analysing the evidence; and by supporting interpretations with evidence and offering a balanced perspective.

7. Generalisability

Generalisability is concerned with how applicable theories, which are generated in one setting, are to other settings (Yin, 2003). In qualitative research, statistical generalisability to a wider population is not the objective. Some authors, for example Lee and Baskerville (2003) maintain that the only way to generalise to a new setting in interpretive research is for a theory to survive an empirical test in that setting. However, Walsham (2006) suggests that a researcher can generalise to concepts, theory, specific implications or to rich insights. In general, the main focus in qualitative research is on insuring appropriate representation of the study's events and on understanding the key issues under investigation. However, because of the nature of individuals and organisations, it is not unreasonable to expect that some findings may be transferable to other organisations. According to Remenyi et al (1998), a detailed understanding of the issues in a particular case can form the basis for better understanding those issues in other similar settings. Transferability to other settings depends on the congruence between the "*sending context*", i.e. the context in which the research was conducted, and the "*receiving contexts*" i.e. the contexts to which the research findings are to be applied (Koch, 2006; Lewis and Ritchie, 2003: 268). Lewis and Ritchie (2003) use the term inferential generalisation to reflect the concept of transferability to other settings. The researcher needs to provide detailed descriptions of context and phenomena so as to enable others to assess the findings' transferability.

8. The research audit trail

Strategies for establishing research confirmability need to be built into the qualitative research process. Several researchers recommend the development of a research audit trail, for example Heopfl (1997). Koch (2006) suggests that a study's trustworthiness may be established if a reader is able to audit the events, influences and actions of the researcher, while Akkerman et al (2006) suggest that audit trails represent a means of assuring quality in qualitative studies. The development of a research audit trail is in line with Seale's (1999: 158) guideline to use "*reflexive methodological accounting*" in demonstrating that a research study was carried out with considerable care. According to Rice and Ezzy (2000: 36):

> *"maintaining and reporting an audit trail of methodological and analytic decisions allows others to assess the significance of the research".*

The audit trail concept stems from the idea of the fiscal audit, where independent auditors authenticate a firm's accounts and examine them for the possibility of error or fraud (Koch, 2006). A similar concept can be used in confirming qualitative research. The origins of the audit trail process in qualitative research can be traced to the work of Lincoln and Guba (1985). They suggest that by implementing an audit trail, an auditor or second party who becomes familiar with the qualitative study, its methodology, findings and conclusions can audit the research decisions and the methodological and analytical processes of the researcher on completion of the study, and thus confirm its findings. According to Sandelowski (1986), a study's findings are:

> *"auditable when another researcher can clearly follow the decision trail used by the investigator in the study. In addition, another researcher could arrive at the same or comparable but not contradictory conclusions given the researchers data, perspective and situation".*

Audit trails document the course of development of the completed analysis. In developing an audit trail, a researcher provides an account of all research decisions and activities throughout the study. He/She makes explicit all decisions taken about theoretical, methodological and analytic choices (Koch, 2006). He/She examines the research process and the product of inquiry to determine the findings trustworthiness. In order to develop a detailed audit trail, a researcher needs to maintain a log of all research activities, develop memos, maintain research journals, and document all data collection and analysis procedures throughout the study (Creswell and Millar, 2000). Lincoln and Guba (1985) discuss six categories of information that need to be collected to inform the audit process:

- 1.Raw data

- 2.Data reduction and analysis notes
- 3.Data reconstruction and synthesis products
- 4.Process notes
- 5.Materials related to intentions and dispositions
- 6.Preliminary development information

Through examining these information categories, a researcher can better assess whether the study's findings are grounded in the data, whether inferences are logical and so on. Hence, the audit trail requires clarification and self reflection on the researcher's part (Akkerman et al, 2006). It enables a researcher to reflect on how a study unfolded. Further, it helps a reader to follow each stage of the process and trace through the research logic and helps other researchers determine whether a study's findings may be relied upon as a platform for further inquiry and as a basis for decision making. However, despite its role in establishing research confirmability, the audit trail is rarely implemented in practice.

Research audit trails may be intellectual or physical in nature. An intellectual audit trail assists the researcher in reflecting on how his/her thinking evolved throughout all phases of the study. A physical audit trail documents stages of a research study, from identification of the research problem to development of new theory; and it reflects the key research methodology decisions. Physical and intellectual audit trails for an empirical research study are developed in the following section.

9. The development of a research audit trail for a qualitative research study

9.1 Background to the research study

The research study for which the audit trails were developed was centred on the ICT investment evaluation process. Despite decades of research, ICT evaluation remained one of the most important unresolved concerns in information management (Nijland, 2003). There was evidence of a lack of formal ICT evaluation in organisations. In many instances evaluation techniques were used ritualistically, under-used or not applied at all (Hughes et al, 2003). Further, a review of the literature revealed that ICT evaluation research in Higher Education Institutions was somewhat overlooked. Of 238 papers published in the years 2002-2006 of the European Conference on Information Technology Evaluation (ECITE), only five papers addressed the evaluation of ICT systems in the Higher Education sector. Further research was required in this area as these systems represented the means for competitive parity with or advantage over other educational establishments. This project sought to better understand the ICT investment evaluation process through evaluating the impact of a large-scale standard student MIS implementation in the Irish Institutes of Technology (IoTs).

9.2 Research methodology

The interpretivist research paradigm offered the opportunity to develop an in-depth understanding of the ICT system's impact; it facilitated the capture of contextual depth and detailed, nuanced descriptions; and avoided the unproblematic, value-free view of organisations associated with positivist approaches. The study's research methodology is outlined in Figure 1. The case study was the selected research method and was based on data collected from five sources – organisational websites, project documentation, newspaper articles, independent reports and semi-structured interviews. The case study is a key tactic in interpretive ICT research (McBride and Fidler, 2003; Walsham, 2004) and has been adopted by numerous authors such as Bergamaschi and Ongaro (2002), Bobeva and Williams (2003), Griffiths and Stern (2004), and Huang (2003). It was employed in 36% of research designs studied by Chen and Hirschheim (2004). The case study was defined by Yin (2003: 13) as:

> *"an empirical inquiry that investigates a contemporary phenomenon within its real life context, when the boundaries between the phenomenon and the context are not clearly evident, and in which multiple sources of evidence are used".*

The case study is appropriate in situations where a single explanation cannot provide a complete account of the research topic. It is suitable for achieving in-depth, holistic knowledge of broad, complex phenomena and in understanding interactive processes, relationships, political issues and influence tactics within specific contexts. Hence, it offers greater depth of enquiry than many other tactics. It provides up-to-date information, making it suitable for the study of contemporary issues (Al-

Shehab et al, 2005; Gengatharen and Standing, 2004; Lewis, 2003; Marshall and Rossman, 1995; Pather et al, 2004; Serafeimidis and Smithson, 1999).

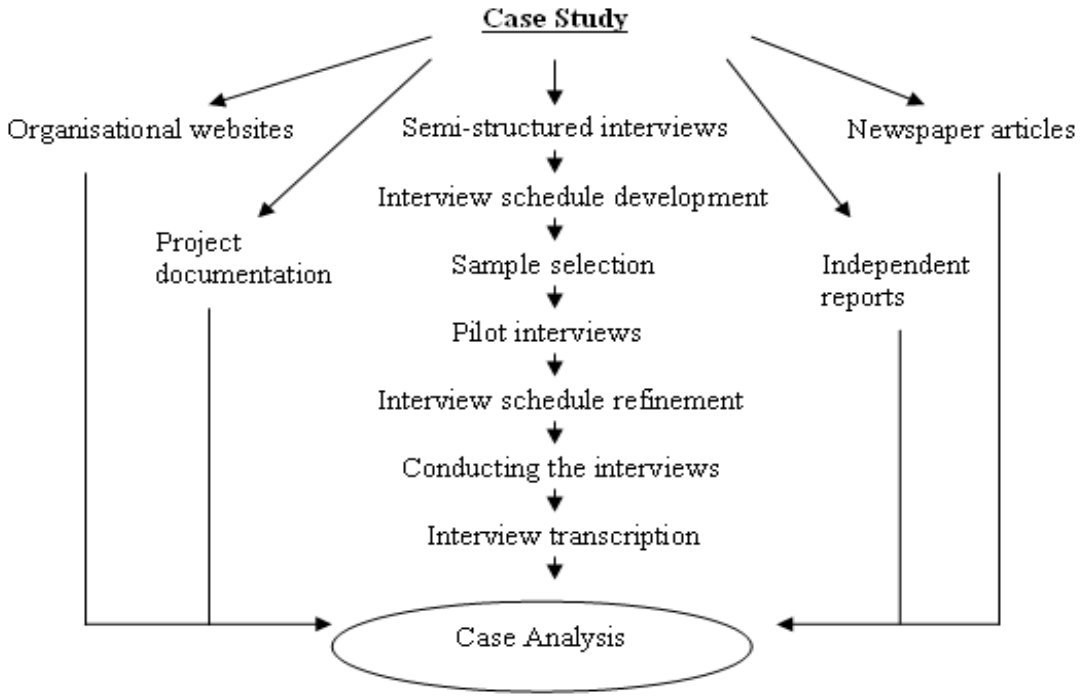

Figure 1: Research methodology

Case studies were conducted within five IoTs. Purposive sampling was used in case site selection as this sampling strategy helps ensure that key research themes are addressed and that diversity in each category is explored. The five case sites were selected due to their diversity in a number of respects. They participated in different implementation waves, were geographically dispersed and differed in their student population sizes and academic programme offerings. The most valuable source of case study evidence was semi structured interviews.

The interview enables depth, nuance and complexity in data to be captured (Mason, 2002) and is generative in that new knowledge may be uncovered (Legard et al, 2003). Its popularity is linked to its ability to obtain a range of informant views and to communicate multiple perspectives on a phenomenon (Johnson, 2001). It provides an undiluted focus on the informant and offers opportunity for clarification and greater understanding through use of follow-up questions (Legard et al, 2003; Ritchie, 2003). According to Kvale (1996: 1), the interview helps to:

> *"understand the world from the subject's point of view, to unfold the meaning of people's experiences, to uncover their lived world prior to scientific explanations".*

Mishler (1986) regarded the interview as an interactional accomplishment; Rubin and Rubin (1995) and Johnson (2001) suggested it was a conversational partnership; while Mason (2002) classified it as a type of social interaction. Kvale (1996: 14) regarded the interview as:

> *"an inter view, an inter change of views between two persons conversing about a theme of mutual interest".*

These comments suggest that the interviewer and informant interact and influence each other. Hence, interviews involve a dual aspect – personal interrelations between the interviewer and informant, and the knowledge, meaning and understanding that results from their dialogue and interaction. In general, the interview takes place in an interpersonal context which is influenced by power, emotion and the interpersonal process. Hence, in interpreting statements made by informants, the researcher always needs to bear in mind the context in which the interview took place (Ellis and Berger, 2001). As stated by Warren (2001: 98):

> *"in the social interaction of the qualitative interview, the perspectives of the interviewer and the respondent dance together for the moment but also extend outward in social space and backward and forward in time".*

Within the IoTs, 49 semi-structured interviews were carried out between 30 November 2005 and 24 May 2006 with senior management personnel, MIS team personnel and system end users. The selected informants were closely involved in the ICT project and had in-depth knowledge of the subject area. The approach I adopted corresponded to what Kvale (1996) termed the "*traveller metaphor"* of interview research. In this approach, the interview process is regarded as the creation of stories; the meaning of informants' stories is uncovered through the researcher's interpretations and these are shaped by the researcher into new convincing narratives of the evidence collected. In the traveller metaphor, Kvale (1996: 4) suggested that the interviewer is a:

> *"traveller on a journey that leads to a tale to be told upon returning home…The interviewer wanders along with the local inhabitants, asks questions that lead the subjects to tell their own stories of their lived world, and converses with them in the original Latin meaning of conversation as 'wandering together with'".*

In adopting the interviewer as traveller approach, the goal was not to extract specific details from individual informants; rather it was to explore questions such as *how?* and *why?*. Through gathering many informant stories in this manner, it was possible to develop a greater understanding of the issues in a broader context.

Each interview lasted between 60 and 90 minutes, was recorded with the informants' permission and was later transcribed. The informants were given the opportunity to verify the transcripts prior to analysis. Further, the supporting documentation was valuable in corroborating the evidence collected in the semi-structured interviews. It provided a means of triangulation in that it supplied specific details, and helped to augment and substantiate the interview data. The data analysis process is outlined in Figure 2.

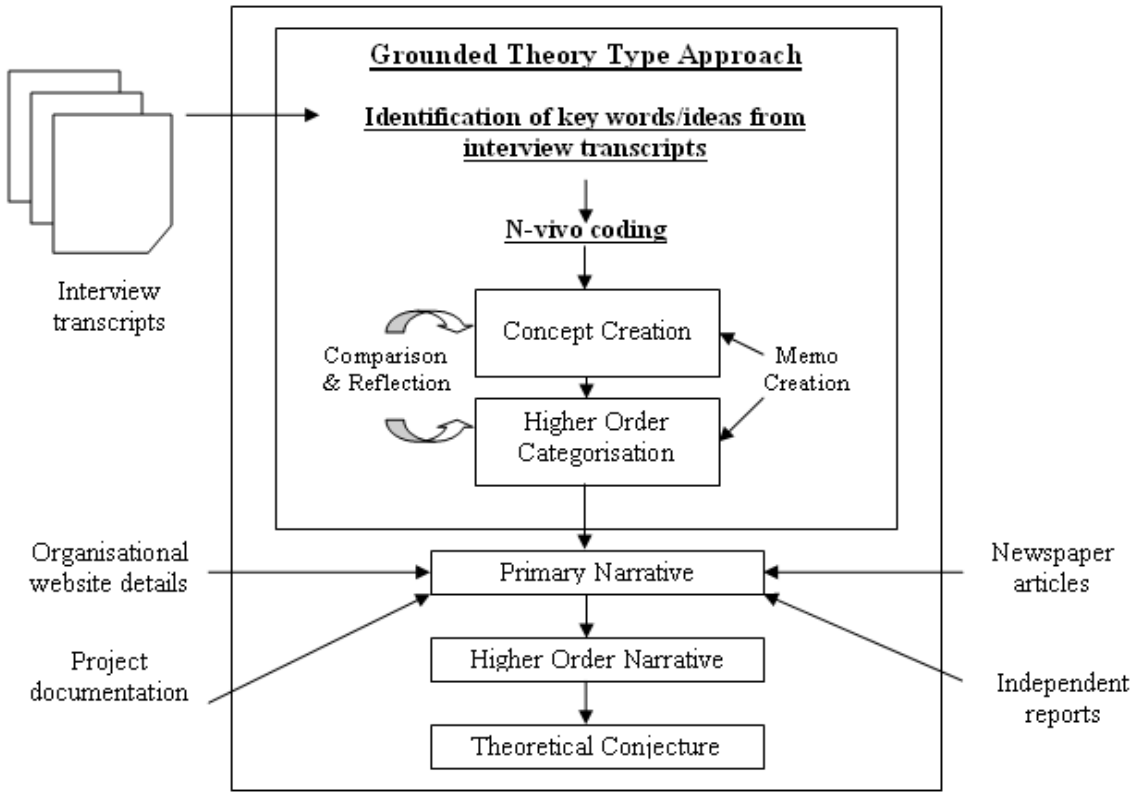

Figure 2: Qualitative data analysis

Data analysis was carried out using a variant of Glaser and Strauss's (1967) grounded theory (GT) method. GT is one of the most widely used qualitative frameworks in business and management studies (Alvesson and Sköldberg, 2000). This GT analysis was supported by a Computer Aided

Qualitative Data Analysis Software (CAQDAS) package called N-vivo. CAQDAS enables researchers to manage qualitative data that would prove onerous through manual "*pen and paper*" methods. The N-vivo package facilitates efficient data indexing and management, and supports analysis through for example relationship and model exploration. As outlined in Figure 2, the interview transcripts were initially imported into this software. Examination of these transcripts led to key words/ideas being identified and these were coded using N-vivo. As coding progressed, it became apparent that many concepts were related and these were reclassified into a series of categories and related sub-categories using N-vivo's hierarchical tree structure. This organised related concepts in relation to the overall research and facilitated greater understanding of the body of evidence through examining the key themes. Memo creation to clarify ideas and identify relationships with other categories, constant concept comparison and iterative reflection on what was already coded were important steps in this coding process.

The key concepts and categories identified through N-vivo coding, as well as important details from the other four sources of case study evidence were synthesised into a detailed cross-case primary narrative of the student MIS project. As outlined by Czarniawska (2004), narratives play an important role in the social world; they are a form of knowledge and communication as complex situations can be better understood in story format. Hence, they enable a researcher to shape various interview stories into a coherent account of the key themes. Through significant reflection on the primary narrative, it was reduced to the principal findings or themes. 15 findings were uncovered and these centred on the evaluation of five different aspects of the project:

- Evaluation of system selection;
- Evaluation of system development for the Irish IoTs;
- Evaluation of system commissioning;
- Evaluation of ex-post performance in the early years;
- Evaluation of ex-post performance at the time of research.

The processes involved in distillation of the key findings involved both creativity and flexibility. Re-trawling the higher order narrative, to establish relationships between the findings and the extent to which they influenced each other, was the basis for developing the study's theoretical conjecture. This reflected a distillation of the knowledge acquired through data analysis and provided new insights into the ICT investment evaluation process.

9.3 The intellectual research audit trail

As outlined, an intellectual audit trail helps a researcher to reflect on how his/her thinking evolved throughout a qualitative study. The following represents the intellectual audit trail for the ICT evaluation study outlined above:

- **Starting philosophical position:** When I commenced this study my research philosophy was predominantly positivist. This was a result of previously completing a quantitative Masters of Science research study that involved hypotheses testing and statistical data analysis.
- **Questioning the positivist position:** During the Master of Science degree, I became aware of the limitations of positivist research. Its attempts to simplify the real world and produce physical law-like generalisations were restrictive in addressing this study's research problem and in developing new theory. In-depth understandings of complex social issues were sought and these would not be effectively captured through, for example, administering surveys and quantitative data analysis.
- **The search for a philosophical stance:** After significant reading on research methodology and attending research methods courses, I concluded that the interpretivist position was an appropriate foundation for this study. This was due to its holistic nature in attempting to capture contextual depth; and its recognition of the difficulty in making research value-free and the difficulty in understanding the social world through physical law-like rules.
- **Considering alternatives for evidence collection and data analysis:** As grounded theory is one of the most widely used frameworks in qualitative research, this was an appropriate approach for inductive theory development. However, I had difficulty in reconciling its requirement that research needs to be conducted in a theoretical vacuum and the restrictions of micro-coding on researcher creativity and flexibility. Therefore, an adapted grounded theory method was selected;

and this was supported by qualitative data analysis software to help in managing and interrogating the body of empirical evidence.

- **Interpreting the evidence:** Computer Aided Qualitative Data Analysis Software (CAQDAS) facilitated the creation, linking and hierarchical management of data concepts, and enabled cross tabulation of the key issues across all case study sites. This enabled interpretation of the evidence to begin early on. Because of my interpretivist position, interpretation was an iterative process that involved interaction with and reflection on the body of evidence on several levels.
- **Distillation of new theory from the body of evidence:** A narrative approach was selected as a suitable strategy for reporting the qualitative evidence. This was appropriate for the interpretivist position because it enabled the complex situations reported in the data to be better understood in story form. Further, it enabled creativity in developing a coherent story and in exploring the key relationships between issues. Hence, through this research process, the empirical evidence evolved from a set of interview transcripts, to a set of concepts, to a primary narrative, to a higher order narrative, and finally to a new theory and ICT evaluation model and guidelines.

9.4 The physical research audit trail

A physical audit trail documents the stages of a research study, and reflects the key research methodology decisions. The physical audit trail for the ICT evaluation study is as follows:

- **Identification of the research problem:** During the latter stages of my Masters of Science Degree, I discoursed with a number of Faculty members and senior managers within my research institution to identify a suitable area for PhD study. The large-scale student MIS implementation was a contemporary issue across the IoT sector at the time. The project was problematic and it was believed that IoTs were not leveraging the system's potential. A senior manager highlighted the need to evaluate this project, as its impact on IoT operations was not clearly understood.
- **The research proposal:** Based on this research problem, a proposal was developed and submitted to the research institution's research subcommittee for approval. This proposal included an outline of the study, its aims and objectives, and the research questions. The proposal was also submitted to the Irish Research Council for Science, Engineering and Technology (IRCSET), who funded the project. The study was registered in 2005.
- **Reviewing the literature:** An in-depth review of the ICT evaluation literature was undertaken. This focused on the ICT cost and benefit issues and the difficulties in evaluating ICT projects. Despite decades of research in this area, the literature review highlighted that the body of ICT evaluation knowledge was fragmented; there was lack of consensus on how ICT investments should be evaluated; and there were limitations in the evaluation methods used. Further, ICT evaluation in the higher education sector was much overlooked.
- **Designing a research framework:** The next step involved designing a research framework to support the collection of empirical evidence. As it is a key tactic in interpretive ICT research, the case study, based on multiple evidence sources, was selected as an appropriate research strategy.
- **The interview schedule:** The semi-structured interview was the primary source of case-study evidence. Based on issues identified in the literature and in defining the research problem, an initial interview schedule was prepared. This was pre-tested in a number of pilot interviews in order to determine informants understanding of the questions and the depth of the research inquiry, and was subsequently refined.
- **Selection of case study IoTs and knowledge informants:** In order to achieve breadth and depth of coverage across the research issues, five IoTs, which differed in a number of respects, were chosen as case study sites. The informants selected had in-depth knowledge of the student MIS project and these included MIS project team personnel, administrative system end-users and senior managers. Through both purposive and snowball sampling, knowledge informants were identified and asked to participate in the study.
- **Evidence collection:** In total, 49 semi-structured interviews were conducted across five IoTs. These lasted between 60 and 90 minutes and were recorded and transcribed. These transcriptions were later verified by informants. The interview transcriptions, as well as project documentation, independent reports, newspaper articles and website details were used in developing the study's primary narrative.

- **Managing and analysing the empirical evidence:** A grounded theory approach was used to analyse the empirical data. N-vivo software was useful in managing the body of evidence. Through constant data comparison, several ideas/points emerged from the interview transcripts and these were coded into key concepts. Through reflection on these concepts and iterative interaction with the evidence, these were later conceptualised into higher order categories and related sub-categories.
- **Adopting a narrative approach:** The higher order categories and sub-categories were the basis for developing a cross-case primary narrative. This narrative was substantiated by reference to informant statements. Through extended reflection on the primary narrative and considering three questions: What does the text say?, why does the text say what it does?, and what is my understanding of what is taking place?, the primary narrative was reduced to the principle research findings. This process expanded my interpretation of the evidence over a series of stages. 15 key findings centred on five aspects of the project were written up as a secondary or higher order narrative.
- **Distillation of a New Theory:** Through re-trawling the higher order narrative and reflecting on the findings separately and on the findings as a whole, relationships between the key findings were further explored. Through this process the study's theoretical conjecture was distilled. This involved iterative reflection on the relationships and theory refinement. These contributions added to the extant body of ICT evaluation theoretical knowledge.

10. Conclusions – assessing the value of audit trail development

The above audit trails are a simple but useful strategy for determining the trustworthiness of qualitative inquiry. From a researcher's perspective, the need to produce an audit of his/her study upon its completion is an important factor in ensuring that significant emphasis is placed on the theoretical, methodological and analytical decisions made throughout the study and that the researcher critically reflects and evaluates the decisions made. It encourages researchers to develop more in-depth research notes in the form of journals and memos, explaining research decisions and activities, thus increasing research transparency. It is a particularly useful strategy for novice researchers, as it encourages a self-questioning and reflective attitude regarding the steps in the research process.

Secondly, the research audit trails are a valuable tool in enabling other researchers/readers to confirm the research findings. Quality findings, uncovered through an in-depth and transparent research process are critical when used as the basis of further research studies. Through examining a research study and its audit trails, other researchers can independently judge whether research inferences are logical, whether findings are grounded in the data, and whether a study's research process is suitable as a basis of further study. Thus, despite their limited development in practice, research audit trails are an important strategy in confirming qualitative research. This paper calls for heightened focus on the research audit process as a means of evaluating research outputs.

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