Using a Multimethod Approach to Research Enterprise Systems Implementations

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Abstract: This paper explores the use of multimethod research design. With the development and legitimacy of both qualitative and quantitative research, the combination of both types is expanding. In this paper we present how we have explored the multimethod approach by using an example domain in a step-by-step manner, learning about the strengths and weaknesses of this approach. The context is a doctoral research project whose aim is to study critical success factors for Enterprise Resource Planning (ERP) implementation projects.

Keywords: Enterprise Resource Planning, critical success factors, implementation phases, ERP implementation projects

1. Introduction

With the development and legitimacy of both qualitative and quantitative research, the combination of both types of research is expanding (Tashakkori and Teddlle 2003). Lately, the alternative of combining methods – the multimethod approach - has emerged in different research areas as a way of improving research process and findings. “Multiple methods are used in a research program when a series of projects are interrelated within a broad topic and designed to solve an overall research problem” (Morse 2003, p. 196). The main advantages of multimethod work are (Tashakkori and Teddlie 1998): triangulation – seeking to validate data and results by combining a range of data sources, methods, or observers; creativity – discovering fresh or paradoxical factors that stimulate further work; and expansion – widening the scope of the study to take in contextual aspects of the situation. Qualitative and quantitative methods should not be viewed as polar opposites (Van Maanen 1983) since their combination introduces both testability and context into the research (Kaplan and Duchon 1988). Collecting different kinds of data by different methods from different sources provides a wider range of coverage that may result in a fuller picture of the unit under study than would have been achieved otherwise (Bonoma 1985).

Based in a survey of the top Information Systems (IS) journals, Mingers (2001b) mentions that the average of multimethod studies across journals varies rather randomly over time at around the 20%. Because the multimethod design approach is relatively new, there is a lack of research on the topic, and most especially there is a shortage of examples of its applications (Mingers 2001a). In this paper we present how we have explored the multimethod approach by using an example domain in a step-by-step manner, learning about the strengths and weaknesses of this approach. The context is a doctoral research project whose aim is to study critical success factors for Enterprise Resource Planning (ERP) implementation projects. This paper is structured as follows. First, we present the background on the multimethod approach. Then, we describe in detail our example by explaining the research strategy and the research methodology. Finally, we draw some considerations and further work.

2. Background on multimethod research design

In the related literature it is common to find the terms ‘mixed method’ design , ‘multimethod’ design and ‘multiple method’ design that are very often used interchangeably. However, it is important to distinguish these terms. Tashakkori and Teddlie (2003, p. 11) define multiple method as “research in which more than one method or more than one worldview is used”. They define at least three broad categories of these multiple methods: multimethod research, mixed method research, and mixed model research. From the analysis of Tashakkori and Teddlie (2003) we evidence that the distinction among these terms is related to the research stage of the study (definition

of research questions, research methods, data collection and analysis, and the inference process) where the mix of methods is used. Morse (2003, p. 190) provides the following definitions for multimethod and mixed method designs:

- **Mixed methods design** – this is the incorporation of various qualitative and quantitative strategies within a single project that may have either a qualitative or quantitative theoretical drive. The "imported" strategies are supplemental to the major or core method and serve to enlighten or provide clues that are followed up within the core method.
- **Multimethod design** – this is the conduct of two or more research methods, each conducted rigorously and complete in itself, in one project. The results are then triangulated to form a complete whole.

Morse (2003) uses the term research project to refer to a research study focusing in one research question, while research program refers to a cluster of research projects. According to Morse (2003), the major difference between multimethod and mixed method design is that in multimethod design all projects are complete in themselves. Tashakkori and Teddlie (2003) propose the term mixed model research to represent the mixed combination of methods in many or all the stages of the study. Regarding multimethod design, Morse (2003) describes three main principles:

- Principle 1: identify the theoretical drive of the research project.
- Principle 2: develop overt awareness of the dominance of each project.
- Principle 3: respect methodological integrity.

The first principle analyses the importance of the theoretical drive definition. The theoretical drive may be inductive (for discovery) or deductive (for testing). The second principle is related with the awareness of working inductively or deductively at any given time which will ensure that the assumption of each method is not violated. Morse (2003) defines two types of multimethod designs that may be applied: simultaneous and sequential designs. Using a categorization of qualitative and quantitative methods and the two main types of multimethod design, Morse (2003) proposes eight combinations of multimethod designs (see table 1). According to Morse's naming convention indicates, awareness of the theoretical drive by using uppercase/lowercase notations indicating that the major methods (a plus [+] sign indicating that the methods are used simultaneously or an arrow [→] indicating directions), with uppercase representing dominance and lowercase representing the supplemental projects.

Table 1: Characteristics of multimethod designs, source: Morse (2003).

Design type	Combination
Simultaneous	QUAL+qual indicates a qualitatively-driven, qualitative simultaneous design. QUAN+quan indicates a quantitatively-driven, quantitative simultaneous design. QUAL+quan indicates a qualitatively-driven, qualitative and quantitative simultaneous design. QUAN+qual indicates a quantitatively-driven, quantitative and qualitative simultaneous design.
Sequential	QUAL→qual indicates a qualitative-driven project followed by a second qualitative project. QUAN→quan indicates a quantitative-driven project followed by a second quantitative project. QUAL→quan indicates a qualitative-driven project followed by a second quantitative project. QUAN→qual indicates a quantitative –driven project followed by a second qualitative project.

Morse (2003) mentions that research projects may have complex designs containing combinations of the above (table 1), depending on the scope and complexity of the research program. The third principle emphasizes the need to keep the integrity of each research method. "It is important not to violate the assumptions, sampling (appropriateness and adequacy of data), and so forth" (Morse 2003, p. 199). Hunter and Brewer (2003, p. 578) mention that the multimethod approach "is a strategy for overcoming each method's weaknesses and limitations by deliberately combining different types of methods within the same investigations". Mingers (2001a) proposes a framework for mapping the research methods in a multimethod design approach. This framework is based in two important features for multimethod research: its multidimensionality and the different types of activity that need to be undertaken within the phases of research.

"By combining these two factors, a grid is produced that can be used to map the characteristics of different research methods to help in linking them together" (Mingers and Brocklesby 1997). Regarding multidimensionality and based on Habermas's theory, Mingers (2001a) says that we can categorize research methods in terms of their relationship to the three worlds – the material world, the social world, and the personal world. The definitions of these worlds are included in table 2.

Table 2: Three worlds relevant to research methods proposed by Mingers (2001).

World	Characteristics
The Material World	It is outside and independent of human beings. It existed before us and would exist whether or not we did. We can shape it through actions, but are subject to constraints. Our relationship to this world is one of observation, but such observations are always theory and subject dependent. We can characterize this world as objective in the sense that it is independent of the observer, although clearly our observations and descriptions of it are not.
The Personal World	It is the world of our own individual thoughts, emotions, experiences, and belief. We do not observe it, but experience it. This world is subjective in that it is generated by, and only accessible to, the individual subject. We can aim to express our subjectivity to others and, in turn, appreciate theirs.
The Social World	It is the world that we share and participate in. Our relation to it is one of intersubjectivity because it is, on the one hand, a human construction, and on the other, it goes beyond and preexists any particular individual. It consists of a complex multilayering of language, meaning, social practices, rules, and resources that both enables and constraints our actions and is reproduced through them. One of its primary dimensions is that of power.

For the second dimension of multimethod research framework – the phases of the research process, Mingers (2001a, p. 245) identifies four phases:

- **Appreciation** of the research situation as experienced by the researchers involved, expressed by any actors in the situation, and prior literature and theories. This will involve the identification of the experience or phenomena to be explained, initial conceptualization and design of the study, and the production of basic data using methods such as observation, interviews, experiments, surveys, or qualitative approaches.
- **Analysis of the data** produced so as to understand the history that has generated it, and the particular structure of relations and constraints that maintain it. This will involve analysis methods appropriate to the methodology of the study and the data produced in the first stage.
- **Assessment** of the postulated explanation(s) in terms of other predicted effects, alternative possible explanations, and, within action research, consideration of ways in which the situation could be other than it is. The assessment phase also involves interpretation of the results, and inherence to other situations.
- **Action to report** on and disseminate the research results and, if necessary or desired, to bring about change to the situation.

Mingers (2001a, p. 246) emphasizes that these activities are not seen as discrete stages that are enacted one by one, with their relative importance differing as the project progresses. He also states that different studies will place their emphasis at some stages rather than others. Next we describe and example of a research program we carried out using the multimethod approach.

3. Conceptual framework

This section shows the doctoral research proposal related with ERP systems implementation phase, namely with the Critical Success Factors (CSF) associated to ERP implementation projects. The conceptual program framework diagram is represented in figure 1. The research area was ERP systems and aspects such as: overview, importance, project management, issues and ERP life-cycle. The research context was the ERP implementation phase, and its success or failure. The support to ERP implementation through CSF and related

Key Performance Indicators (KPI) have been studied. We have also attempted to understand the management of these CSF and KPI.

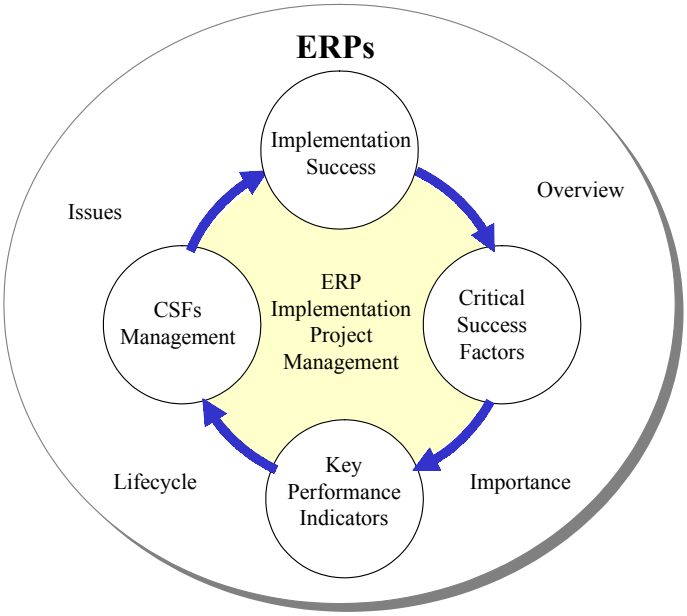

Figure 1: Conceptual framework.

4. Research strategy

In this section we outline the doctoral research proposal. First, we define the research questions. Second, we present the goals to be achieved. The motivation aspects are then presented. Finally, we present the multimethod research framework

4.1 Research questions

The general research questions of the doctoral research study were the following:

- What are the CSF for an ERP implementation project?
- What is the relevance of each CSF along the typical implementation project stages?
- How these CSF are managed and influence ERP implementation projects?
- What are the KPI related to the above CSF?

4.2 Research goals

The main research purpose of this study was to get an understanding of project management practices in the realm of ERP implementations by focusing on the analysis of CSF and the generation of KPI as well as their contribution to monitoring the implementation phase, in order to help managers in the task of project management. The definition of goals was done accordingly to the decision-making structure presented in figure 1. We attempted to achieve the following goals:

- **Definition of CSF needed for a successful ERP implementation**. All the studies related with CSF and ERP implementations are based on case studies so, first, we have integrated these CSF in a unique unified model.
- Understand how CSF are managed in ERP implementations.
- **Generation of a set of KPI to help with the monitoring of CSF.** Usually, once CSF are established, each process and department is encouraged to identify indicators that can be used to measure its contribution. KPI can be used to monitor the ERP implementations and, help in CSF analysis, thus helping managers in the decision making process related to the ERP implementation phase (see figure 1).

4.3 Research paradigm

Following the first principle of Morse (2003) we defined the theoretical drive of our research. In order to develop this doctoral research project we decided to

adopt the interpretive research paradigm. Interpretive research assumes that "our knowledge of reality is gained only through social constructions such as languages, consciousness, shared meanings, documents, tools, and other artifacts" (Klein and Myers 1999, p. 69). Interpretive research does not predefine dependent or independent variables and it attempts to explain phenomena through the meanings that people assign to them (Orlikowski and Baroudi 1991). According to Walsham (1993) the purpose of the interpretive approach in IS is to produce an understanding of the context of IS and the process whereby IS influences and is influenced by the context. Interpretive research approach gives the researcher greater scope to address issues of influence and impact, and to ask questions such as "why" and "how" particular technological trajectories are created (Orlikowski and Baroudi 1991). Aladwani (2001, p. 267) states that "past ERP implementation research may be described as factor research, which involves identifying the factors or variables that are critical for implementing ERP successfully. Although factor research is valuable for advancing our understanding of ERP implementation success, it adopts a static view, which limits its adequacy in explaining the dynamics of the implementation process". Aladwani (2001) and Robey et al. (2002) suggest a process research approach or a combination of factor and process approaches, in order to improve research in ERP topics. Using a process approach, ERP implementation may be conceived as sequences of discrete events that lead to outcomes of particular interest. Another perspective is that an ERP implementation may be conceived as a sequence of stages, in which related activities occur (Robey et al. 2002). Our aim is to use both factor and process approaches in order to study CSF for ERP implementation projects.

4.4 Research design

We agree with Robey (1996, p. 406) when he says that "theoretical foundations for research and specific research methods are justified by research aims, or purposes. They should not be chosen because they conform to a dominant paradigm or because the researcher believes in their intrinsic value. Rather theory and method are justified on pragmatic grounds as appropriate tools for accomplishing research aims". Therefore, in order to accomplish the research aims of this research, we propose a research framework (see figure 2) that combines various research methods, both quantitative and qualitative, with predominance of qualitative ones. This type of research is defined as "multimethod" research by Mingers (2001). There is a move in the IS field toward combining qualitative and quantitative methods (Mingers 2001). These methods need not to be viewed as polar opposites (Van Maanen 1983) since their combination introduces both testability and context into the research (Kaplan and Duchon 1988). Collecting different kinds of data by different methods from different sources provides a wider range of coverage that may result in a fuller picture of the unit under study than would have been achieved otherwise (Bonoma 1985). The use of multiple methods increases the robustness of results because findings can be strengthened through triangulation – the cross-validation achieved when different kinds and sources of data converge and are found congruent (Kaplan and Duchon 1988).

The doctoral research framework (see figure 2) presents the different phases of the research study, and with the different research methods mapped and linked in each phase. Considering the research questions and the research context, we asked ourselves which research methods could be useful to address those questions. These are the research methods that we believe are appropriate for this research study. At the beginning we accepted that some research methods could change accordingly to the outcomes that we would obtain in each research phase.

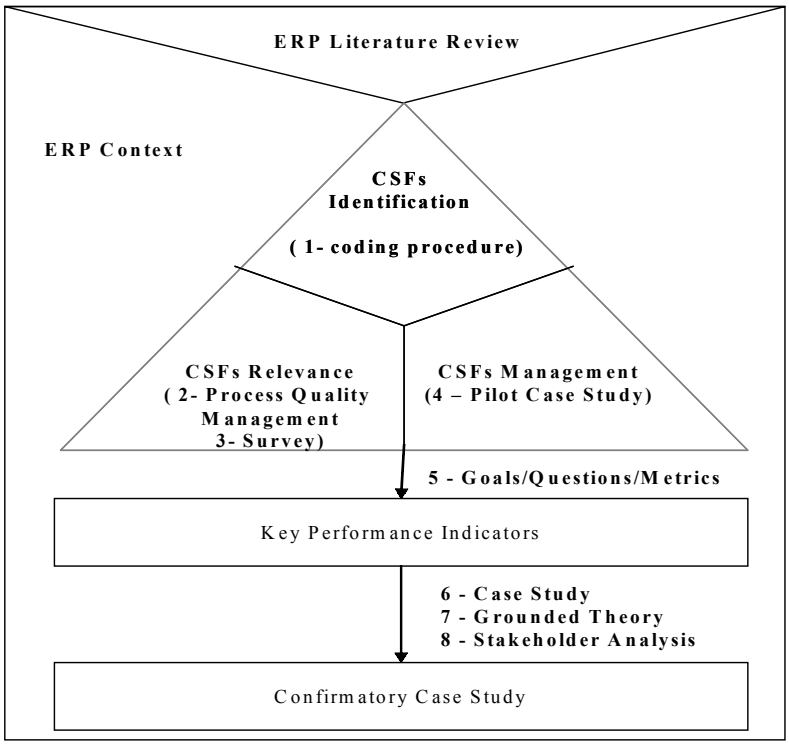

Figure 2: Multimethod research framework proposal.

Next, we describe each research phase that we carried out using the multimethod approach.

4.5 Multimethod design followed

In order to accomplish the research aims of this research, we proposed a multimethod research framework (see table 3) that combined various research methods, both quantitative and qualitative, with predominance of qualitative ones. The use of multiple methods increases the robustness of results because findings can be strengthened through triangulation – the cross-validation achieved when different kinds and sources of data converge and are found congruent (Kaplan and Duchon 1988). Taking into account the research questions and the research context, we asked ourselves which research methods could be useful to address those questions. These are the research methods that we believe are appropriate for this research study. At the beginning we accepted that some research methods could change accordingly to the outcomes that we would obtain in each research phase. Mainly, our approach follows the QUAL→qual and the QUAL→quan design type according to Morse (2003) typology. We would like to emphasize that our model is quite complex with some combinations proposed by Morse (2003). Next, we briefly describe each research phase and the respective research methods used.

Table 3: Multimethod research framework proposal.

Research Phase	Type	Research methods used									
		Literature review	Coding procedure	Case study	Process quality management	Survey	Web survey	Statistical analysis	Grounded theory	Goals/questions/metrics	Stakeholder analysis
ERP implementation projects	QUAL	●									
CSF identification	QUAL→quan	●	●				●	●			
CSF relevance	QUAL→qual				●	●					
CSF management	QUAL→qual			●					●		
Key performance indicators	QUAL→quan	●								●	
Confirmatory case study	QUAL→qual			●					●		●

4.5.1 ERP implementation projects

The first phase of this research framework consisted in an extensive literature review on the ERP topic. Based on this literature review, we provided an annotated bibliography of the ERP publications published in the main Information Systems conferences and journals with which we reviewed the state of art in this area (Esteves and Pastor 2001). The surveyed publications were categorized through a typical ERP lifecycle. Furthermore, the survey included proposed topics for further research in each phase. One of these topics was CSF for ERP implementation projects.

4.5.2 CSF identification

The purpose of this phase was to identify and define the CSF for ERP implementation projects. We developed a unified model of CSF based on prior research with partial CSF lists through the application of the Open Coding procedure from the Grounded Theory method (Glaser and Strauss 1967). The number of CSF is large but they are divided in four perspectives: strategic and tactical perspectives, and organizational and technological perspectives. We also compared the CSF for ERP implementations with CSF for other IS implementation projects. Finally, we carried out specific research to clarify the project champion role CSF since during the literature review we found some misunderstandings regarding this figure, for which we used the web survey method to collect the data. This data was analyzed through qualitative procedures and by using some statistical analysis. The findings show that the project champion is associated to the project sponsor role and that project sponsor and project manager are both identified as CSF for ERP implementation projects. This clarification was used to refine our prior CSF unified model.

4.5.3 CSF relevance

The purpose of this phase was to analyze the CSF relevance along the typical ERP implementation phases using the Process Quality Management (PQM) method. The PQM developed by IBM is "designed to assist the management team reach consensus on the most critical business activities, i.e. those whose performance will have the biggest impact on the success or failure of the enterprise" (Ward 1990, p. 105). The PQM method uses the concept of CSF (Rockart 1979) to encourage management teams to focus their attention on the critical issues of the business, and then to base the IT strategy on these. This is a novel way of studying CSF relevance since until now researchers have used case studies or surveys. By applying PQM and using the ASAP implementation methodology as a reference for the SAP implementation processes, we defined the CSF relevance for each CSF along the SAP implementation phases. Then, we contacted two professional experts on SAP implementations and we asked them to verify the relationships between CSF and SAP implementation processes that we had previously established. We asked them to provide an argumentation for each

change. Overall, their opinion was that our analysis was very accurate and rigorous.

Next, we extrapolated our findings to other ERP studies by comparing our relevance schema with others proposed by other colleagues. One of the limitations of PQM is that the process structure of the PQM is too simple since it only provides one level of process analysis. Since the structure of ERP implementation processes implies project process structures that are more complex, we proposed the improvement of the PQM analysis section to provide more depth to these complex project structures. We then extended the standard PQM method, with a new criticality indicator for complex implementation project process structures. This criticality indicator was used to define and analyze the most critical SAP implementation processes. Finally, we analyze the relevance of knowledge types along the SAP implementation phases. Our research model helped to provide some exploratory insights on knowledge types needed for the management of CSF and also to analyze the relevance of these knowledge types along the SAP implementation phases.

4.5.4 CSF management

To study the management of CSF we opted for using the case study method. A case study is “an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident and it relies on multiple sources of evidence” (Yin 1994, p. 13). We conducted a pilot case study of an ERP implementation in a Portuguese Small and Medium enterprise (SME). This SME was selected because we detected a lack of studies on ERP implementations on SME, and the geographic location. Since Portugal is the country of the doctoral student, the language spoken and the knowledge of Portuguese society were an advantage, and the SME is located near the home residence which helped to keep contact with interviewers. Finally, the SME managers were open to provide access to all the project documentation. All these reasons are point out by Yin (1994) as valid reason to select a pilot case study.

The pilot case study helped to validate the research framework and the preparation of the in-depth case study (see validation phase below). Yin (1994) states that the case study approach "allows an investigation to return the holistic and meaningful characteristics of real life events - such as individual life cycles, organizational and managerial processes...and the maturation of industries". As Stewart and Gable (1999) comment:

- This approach is appropriate to understanding ERP implementation issues because the research objective is to characterize the organizational and managerial processes constraining such implementations,
- It provides useful skills to researchers,
- It is most appropriate to understanding the interactions between the issues (as theoretical construct) and the context within which these issues are operating.

According to Yin (1994, p. 77), “the pilot case study helps investigators to refine their data collection plans with respect to both the content of the data and the procedures to be followed. The pilot case is used more formatively, assisting an investigator to develop relevant lines of questions – possibly even providing some conceptual clarification for the research design as well”. The pilot case study serves as a preparation for the in depth case study. Since there were no studies related with this topic, the pilot case study also served as an exploratory case study.

The data collected in our pilot case study was analyzed using Grounded Theory (GT) method. GT is a general methodology for developing theory that is grounded in data systematically gathered and analyzed. Strauss and Corbin (1990, p. 23) explain that by using GT method “a theory is inductively derived from the study of the phenomenon it represents. That is, it is discovered, developed, and provisionally verified through systematic data collection, analysis, and theory stand in reciprocal relationship with each other. One does not begin with a theory, and then prove it. Rather, one begins with an area of study and what is relevant to that area is allowed to emerge”. GT method seems particularly useful for this doctoral research since there is a lack of theoretical foundation in ERP implementation topics

(Robey et al. 2002, Esteves and Pastor 2001). Another important characteristic of GT method is that it facilitates "the generation of theories of process, sequence, and change pertaining to organizations, positions, and social interactions "(Glaser and Strauss 1967, p. 114). This seems particularly useful in our research since the literature reveals that organizational perspective has a strong influence on ERP implementations.

4.5.5 Key performance indicators

In this phase we developed a set of Key Performance Indicators (KPIs) for each CSF in order to improve the management, control and monitoring of the CSF defined previously. We used the Goals/Questions/Metrics (GQM) method. The GQM approach is a mechanism for defining and interpreting operational, measurable goals. It was developed at the University of Maryland as a mechanism for formalizing the tasks of characterization, planning, construction, analysis, learning and feedback. GQM does not provide specific goals but rather a framework for stating measurement goals and refining them into questions to provide a specification for the data needed to help achieve the goals (Basili et al. 1994). The GQM top-down approach assists managers and developers not only in knowing what data to collect but also in understanding the type of analysis needed when the data is in hand (Pfleeger et al. 1997). Because of its intuitive nature the approach has gained widespread appeal. As a result, we proposed a GQM preliminary plan with different metrics to monitor and control CSF while implementing an ERP system.

4.5.6 Confirmatory case study

To validate all our previous research we have recently conducted an in-depth case study combined with the GT method of an ERP implementation in a big Spanish university. This case study may be considered a critical case (Yin 1994). This ERP implementation was selected because the authors maintain a very close relationship with that university, thus, we can understand better the ERP implementation context, and second, this ERP implementation was the first to implement a specific ERP, in this case the SAP system in a Spanish university with the ISPS module for budget management. Nowadays, this last aspect also makes it a unique case study in Spain. Different research techniques have been used to collect data and to increase credibility and validity to the case study (Yin 1994).

Again, the data collected was analyzed through the GT method. In this doctoral research program we adopt Strauss viewpoint of GT method rather the one by Glaser. The key distinction relates to the position the researcher takes in relation to the data. Glaser (1992, p. 4) states that a GT can only be grounded in the data and would otherwise be a preconceived conceptual description of the phenomenon under investigation. Glaser (1992, p. 22) states that a preconceived research problem will necessarily obstruct the researcher's view of the data while Strauss and Corbin (990) suggest several sources of research problems including suggested or assigned (for example by a professor to a graduate student), technical literature, and personal and professional experience. They believe that "the research question in a grounded theory study is a statement that identifies the phenomenon to be studied" (Strauss and Corbin 1990, p. 38). For Glaser (1992, p. 22) the researcher begins his or her study "with the abstract wonderment of what is going on that is an issue and how it is handled". The second main divergence concerns theory generation versus theory verification. Strauss and Corbin (1990) emphasize on verification and validation of theory and hypotheses "throughout the course of a research project" (Strauss and Corbin, 1994, p. 274). In Glaser's opinion, verification falls outside the parameters of grounded theory which instead should be directed at the discovery of hypotheses or theory. Glaser reminds the reader that the verificational model was "exactly what we had tried to get away from" (Glaser and Strauss 1967, p. 67).

This choice has implications for the research design and the research outcomes. We acknowledge these differences. However, our idea in using the GT method is not to provide a grounded theory of ERP implementations as stated by Glaser (1992) but we instead combine the GT method with the case study method to provide a theory that is grounded in data collected from the case studies. Our main purpose for using the GT method is to serve as a research

method to analyze the data collected in our case studies.

5. Trustworthiness of the research

In qualitative research the requirements of validity and reliability are under enthusiastic discussion. There are interpretations that these traditional measures of reliability are not applicable at all in qualitative research because of the nature of the methods and epistemological assumptions of the research, which promote the uniqueness of the research. On the other hand, there are also demands for using the same criteria for qualitative and quantitative research when evaluating the trustworthiness of the research. Between these poles are many different variations for justifying the results of the research. However, the issue of trustworthiness cannot be avoided whatever the epistemological approach of the research (Gibbs 2002, p. 13).

Lincoln and Guba (1985) described the criteria that are frequently cited for evaluating qualitative studies. They address the criticisms leveled at naturalistic research and determine that quality rests in trustworthiness of the study and its findings. They agree with others that conventional criteria are inappropriate for qualitative studies and they proposed: (1) credibility, (2) transferability, (3) dependability, and (4) confirmability, as the alternative the criteria. Next, we describe each research evaluation component.

5.1 Credibility

Credibility refers to the accuracy or credibility of the findings, or it can be described as a “truth formulating process” between the researcher and the informants (Lincoln and Guba, 1985). The goal is to demonstrate that inquiry was conducted in a way which ensures the subject was accurately described. To maximize credibility, Lincoln and Guba (1985) suggest a number of techniques:

- Increase the likelihood that credible findings and interpretations are produced through prolonged engagement, persistent observation, and triangulation.
- Use peer (stakeholder) debriefing to provide an external check on the inquiry process.
- Use negative case analysis to refine the emerging results.
- Make a direct test of findings and interpretations by checking them with participants.

A common technique used is the stakeholder check. Stakeholder checks might involve opportunities for people with a specific interest in the research, such as participants, service providers, funding agencies, to comment on categories or the interpretations made (Erlandson et al. 1993, p. 142). With regard to triangulation, Patton (1987) discusses four types of triangulation in doing evaluations, that is, the triangulation:

- Of data sources (data triangulation),
- Among different evaluators (investigator triangulation),
- Of perspectives on the same data set (theory triangulation) and
- Of methods (methodological triangulation).

Yin (1994) provides a list of data sources that can be used during data source triangulation such as interviews, analysis of documents and direct observation. Bratthall and Jorgensen (2002) extended Yin’s (1994) work by adding some practical guidelines for use during data source triangulation. The triangulation among evaluators will be made by contrasting perspectives among the doctoral student and the doctoral supervisor.

5.2 Transferability

An alternative concept to the logical positivist's generalizability construct (or external validity) is Lincoln and Guba's (1985) transferability. In Lincoln and Guba's (1985) use of the term, “transferability” implies generalizability of the findings and results of the study to other settings, situations, populations, circumstances, etc. The idea beyond generalizability on qualitative studies usually is based, “not on explicit sampling of some defined population to which the results can be extended, but on the development of a theory that can be extended to other cases” (Maxwell 1996, p. 97). Transferability is relative and depends entirely on the degree to which

salient conditions overlap or match. This is mostly verified through “thick” description. The researcher does not provide the confidence limits of the study, but instead provides as complete a data base as possible in order to facilitate transferability judgments on the part of others.

With regard to case study method generalization, Yin (1994, p. 30) noted that another way of thinking about case research is that its results should be generalized to a theory, named analytic generalization in contrast with statistical generalization. “In statistical generalization an inference is made about a population (or universe) on the basis of empirical data collected about a sample” Yin (1994, p. 30) while “in the analytical generalization, the researcher is striving to generalize a particular set of results to some broader theory” (Yin 1994, p. 36).

One of the procedures that may be available to establish transferability, applicable to all but the most exploratory of qualitative studies, is to see whether a given theory or model that the qualitative researcher claims to be testing or applying has, in fact, been accurately interpreted and used in the research. This may be interpreted as a check of 'content accuracy.'

Finally, perhaps the most defensible indicator of transferability is to look for evidence of multimethod procedures in the design and/or analysis of the qualitative study. By applying such different methods and procedures and then triangulating or comparing the different 'paths' or results to see if they 'converge' upon the same findings and results, serve to enhance the believability and robustness of the results - more so than if a single method were used.

5.3 Dependability

This is concerned with the stability of the data over time. Dependability requires accounting for dynamic changes in the phenomenon of study, design, or methodology as appropriate (Lincoln and Guba 1985). Therefore, there is the need to be able to demonstrate any changes or shifts in the way in which the inquiry was conducted. In order to assess the degree of dependability, Lincoln and Guba (1985) advise us to look for accurate and adequate documentation of changes, surprise occurrences, and the like, in the phenomena being studied. If change is to be expected, has it been thoroughly described? Similarly, have any unexpected but material occurrences which might affect our variables of study been identified and documented with adequate detail?

Lincoln and Guba (1985) pointed out that dependability is difficult to predict in a changing social world. In establishing dependability, the researcher attempts to account for changing conditions in the phenomenon chosen for study as well as changes in the design created by increasingly refined understanding of the setting.

5.4 Confirmability

This quality, according to Lincoln and Guba (1985), is synonymous with objectivity. Need to show that data, interpretations and outcomes inquires are rooted in contexts and persons apart from the evaluator and are not simply figments of the evaluator’s imagination. All data needs to be able to be tracked to its source and that the logic used to assemble the interpretations into structurally coherent and corroborating wholes is both explicit and implicit in the narrative of the case study. Evidence for this quality may be established in two ways:

- Via our more traditional notions of credibility: is there a smooth logical progression, as evidenced in the research report. This one, then, depends on the 'internal logic' of the study and particularly how thoroughly and skillfully it is substantiated in the narrative of the research report. Is there a 'natural flow,' or a 'Grand Canyon leap of faith?!' Does it “feel real?!”
- Via some evidence of lack of the researcher's own bias: such as, for instance, doing 'member checks' and running his/her findings and conclusions past third parties, “key informants” from the same or similar field setting as the original study, etc. Perhaps this one is 'established in reverse:' that is, do you see anything in the research report to indicate to you a potential bias on the researcher's part? Premature closure regarding the findings?

Unwillingness to thoroughly search out and account for potential 'disconfirming' evidence? And so forth.

This doctoral research project is found to follow the trustworthiness components described above and thus the research was evaluated against them.

6. Considerations and further work

This paper explores the use of multimethod design. One of the main considerations in the application of a multimethod approach is the knowledge needed about the different research methods. Each research method has its strengths and weaknesses. Like Morse (2003) suggests, one of the main strength of multimethod approach is to obtain a different level of data. These data provides a more comprehensive picture of the findings. One of the limitations of our study is the lack of discussion about the analysis of the research evaluation. Although new models for multimethod design have been proposed by colleagues, there is a lack of studies on multimethod research evaluation. From our experience on this issue, in the future we will attempt to define a research evaluation framework for multimethod design taking into account the different types of multimethod designs.

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