Applying Grounded Theory to Study the Implementation of an Inter-Organizational Information System

Joan Rodon[1] and Joan A. Pastor[2]
[1]Universitat Ramon Llull, Barcelona, Spain
[2]Universitat Oberta de Catalunya, Barcelona, Spain
joan.rodon@esade.edu
jpastorc@uoc.edu

Abstract: This paper shows the application of Grounded Theory (GT) method, particularly the Straussian approach to GT, in a research project that studies the role of managers during and after the implementation of an inter-organizational information system (IOIS). We present the steps followed –sampling, data collection, analysis, and literature comparison– paying special attention to the intricacies that arose during the research process, and we reflect on the lessons learned from using GT in an interpretive case study. The paper shows: first, the application of the coding paradigm proposed by Strauss and Corbin to analyse process data; second, how action diagrams can help structure and report on process data; and, third, the importance of flexibility, creativity, and keeping an open mind when using GT analytical tools, given that various avenues may be apparent before a plausible theory starts to emerge. We consider the paper illustrates some experiences that may inform others in their GT research process.

Keywords: grounded theory, Straussian approach, coding paradigm, action diagrams, inter-organizational IS implementation

1. Introduction

Grounded Theory (GT) can be traced to the seminal work of Glaser and Strauss (1967), "The Discovery of Grounded Theory". In that book, both authors were critical of what they perceived to be an approach to research that drew upon an existing "grand theory" (Mills 1959), and that was satisfied with testing hypotheses built on this underlying theory. In contrast to this hypothetic-deductive approach, GT starts with observations, which are made not to test existing theories, but to discover and generate theories that are as close as possible to the reality observed.

While there are no major differences between the respective views of Glaser and Strauss towards key elements like theoretical sampling and constant comparison, the two founders of GT took somewhat different paths. Strauss continued to refine the coding technique by incorporating more analytical techniques, and gave a more active role to the researcher (Strauss et al. 1990). Glaser, on the other hand, argued that rather than putting more emphasis on methods and forcing structure onto data, the researcher should take a passive stance free from preconceptions, trusting that theory will emerge (Glaser 1992).

This essay adds to the existing literature, which discusses the use of the two GT approaches (Allan 2002; Fernandez 2004; Hunter et al. 2005), by showing how the Straussian approach to GT was applied in a case study (Rodon et al. 2007a) that inquires into the role of managers during the implementation of an inter-organizational information system (IOIS). The purpose of the present paper is not to focus on the results of the GT case study but rather to explain the process followed in conducting such empirical work, paying special attention to the choices and decisions made throughout the research process.

The structure of the paper is as follows. First, we present the initial research problem and justify the choice of GT. The next section presents the research process we followed: sampling, data collection, data analysis, data presentation, and theoretical sampling. Finally, the paper highlights several points of the research process and presents the conclusions.

2. The research problem and the choice of GT

In early 2005, the first author had the opportunity to conduct a research study on the implementation of an IOIS in the seaport of Barcelona. That IOIS implementation had generated many discrepancies and taken more time and resources than the promoters had expected. Our purpose in the study was to inquire into the difficulties that companies had faced and were still facing in the integration of their pre-existing information systems with the IOIS and in the further use of the IOIS. The early research question that guided our research was: how does the integration of pre-existing systems with an IOIS unfold? Finding the answer to this research question involved adopting a process perspective to study the implementation of an IOIS.

Reference this paper as:
Rodon, J. and Pastor, A. (2007) "Applying Grounded Theory to Study the Implementation of an Inter-Organizational Information System." *The Electronic Journal of Business Research Methods* Volume 5 Issue 2, pp 71 - 82, available online at www.ejbrm.com

Then we found from existing IOIS literature critical reviews (Elgarah et al. 2005; Lyytinen et al. 2001; Ramanathan et al. 2003) that there were very few empirical papers proposing process models. Most of prior IOIS studies proposed factor-based models or developed descriptive case studies. Given the lack of process-based IOIS research and our interest in generating new insights on the existing literature, we rejected a purely deductive, hypothesis-testing approach for our study. Moreover, in this study we conceptualized the IOIS as a social-technical system, where the dichotomy between social context and technical artefacts dissolves in the complex intertwining of socio-technical actors (Latour 1987). Given the exploratory nature of the research question, our conceptualization of the IOIS, and our concern with describing and analyzing the emerging process of IOIS implementation, rather than explaining it through cause-effect relations between a set of constructs, we opted for an inductive and interpretive approach, and we chose GT as the research methodology. We proposed conducting an in-depth case study following the principles of GT. According to Eisenhardt (1989), the combination of case study with GT has three major strengths: (1) it is likely to produce "novel theory" (p. 546), (2) "the emergent theory is likely to be testable" (p. 547), and (3) "the resultant theory is likely to be empirically valid" (p. 547).

On the one hand, a case study would allow us to investigate IOIS implementation within its real-life context, and with multiple sources of evidence. On the other hand, the use of GT was justified for the following reasons. First, GT allowed us to focus on contextual, process-based descriptions of the implementation (Myers 1997). We were concerned with discovering process in data, more precisely, in patterns of action and interaction between the people in response to the problems and situations in which they find themselves (Strauss et al. 1994). Second, GT's consistency with interpretive case studies: "ours is interpretive work and… interpretations must include the perspectives and voices of the people whom we study. Interpretations are sought for understanding the actions of individual or collective actors being studied." (Strauss et al. 1994, p. 274). Third, GT provided a set of established guidelines both for conducting data collection and analysis (Goulding 2002), which gave us a sense of security when exploring the unknown territory of IOIS management. Fourth, GT has its roots in symbolic interactionism (Blumer 1969). Symbolic interactionism set out three basic premises: (1) "Human beings act toward things on the basis of the meanings that the things have for them."; (2) "The meaning of such things is derived from, or arises out of, the social interaction that one has with one's fellows."; and (3) "These meanings are handled in, and modified through, an interpretive process used by the person in dealing with the things he encounters" (Blumer 1969). Thus GT was well suited to capture the interpretive experience of adopters of an IOIS. Finally, GT had been a widely used and recognized research method in the IS field (Orlikowski 1993; Urquhart 2001).

3. The grounded theory building process

3.1 Entering the field and conducting a literature review

Even though the research project described in this paper started in 2005, the first author was already familiar with the research setting –the seaport of Barcelona– and the phenomenon under research –the implementation of an IOIS. From 2000 until 2004 the first author had analyzed diverse aspects of the implementation of an IOIS in this research setting. Some of the outcomes were a teaching case and a research paper (Rodon 2003; Rodon et al. 2007b). On the other hand, we reviewed existing literature on IOIS in seaports (Applegate et al. 1995; Applegate et al. 2001; Baalen et al. 2000; Damsgaard et al. 2001; Hock-Hai et al. 1997; Wrigley et al. 1994). Consequently, we started this study with some knowledge about the phenomenon and the research setting, which helped us to delimit our research problem.

Next, as we chose to use GT method, we also analyzed papers in the IS field that had used GT. We then discovered that there were the Glaserian and the Straussian approaches to GT, and proceeded to read the seminal work of Glaser and Strauss (1967). We also complemented these authors' seminal work with the reading of Goulding (2002), and other papers that compared and contrasted the Glaserian and the Straussian approaches. Finally, we opted for the Straussian version because it provides a more structured and linear approach to the methodology. Given that we were uninitiated in GT, we considered that the Straussian version would help more in guiding the data analysis. We then carefully read Strauss and Corbin (1990; 1998).

In parallel, we conducted an initial literature review on IOIS implementation (Rodon 2006), which confirmed that that there was a lack of studies adopting a process-based approach to the study of IOIS implementation –an issue that merited further investigation. An additional reason for choosing the Straussian version of GT was its approach to the use of the existing literature, much more in line with what we had already done in this respect. In fact, Glaser (1992) states that "there is a need not to review any of the literature in the

substantive area under study. This dictum is brought about by the desire not to contaminate…it is vital to be reading and studying from the outset of the research, but in unrelated fields" (Glaser 1992, p. 32). On the other hand, Strauss and Corbin (1990) are more open to the role of existing literature, maintaining that "all kinds of literature can be used before a research study is begun" (Strauss et al. 1990, p.56).
In our case, however, given the results we obtained from the literature review (Rodon 2006), we were not contaminated by existing theory as it did not suggest any hypotheses. We moved on to the next step in the research process without a preconceived theory or model in mind. Thus, we started with an area of study – IOIS implementation–, a focus on the implementation process, immersion in the research setting, and allowed the theory to emerge from the data. Figure 1 shows the stages followed in the GT building process.

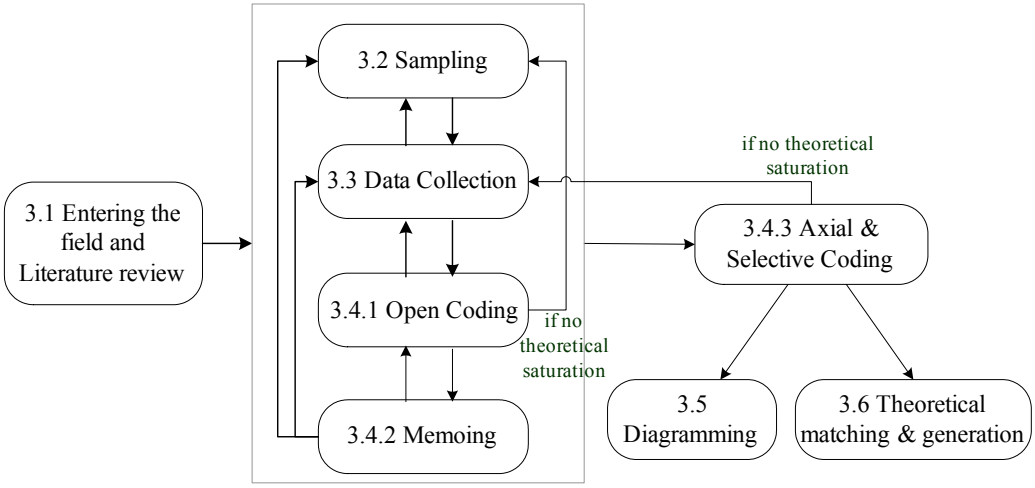

Figure 1: Grounded Theory building process

3.2 Sampling

Sampling is an ongoing part of the process of data collection and consists of selecting a sample according to the emerging theory. On the one hand, the collection of data is guided by the sample. On the other hand, the sample is redefined by the emerging theory and it is therefore impossible to predict the size of the sample prior to starting the study.

We started with an open sample, which consisted of 11 companies operating in the Seaport of Barcelona. We selected those companies based on the following criteria: (1) companies playing different roles (e.g., freight forwarders, haulers, shipping agents, inland terminals); and (2) companies that had been successfully using the IOIS as well as companies that had failed or rejected to use the IOIS. These companies were selected after we interviewed managers of the IOIS and the Port Authority of Barcelona. We then wrote to the companies in the sample, inviting them to participate in the study. The letters were signed by the first author and the manager of the IOIS. We stated the aim of the study as: "to enhance the understanding of the use of PortIC [the name of the IOIS] in order to define new information services and applications that would increase the efficiency and effectiveness of transactions, as well as to enhance the use of PortIC among port agents". The eleven companies all decided to take part in the study.

3.3 Data collection

We started interviewing the general managers of five of the companies in the sample. We asked these managers to give their views of the IOIS, their reasons for adopting (or rejecting) it, the expected benefits, and the problems they were facing in integrating with and using the IOIS. Once we had interviewed these managers, sampling became more focused. We then interviewed real users of the system (operational managers and clerks) and information systems personnel of these companies (managers, analysts, and developers).

We asked them to explain their experience in using and integrating with the IOIS, paying special attention to relevant events and problems that shaped the way their companies were integrating their information systems with the IOIS or the way they were using the IOIS. From a conceptual standpoint, our research involved understanding human behaviour and action from the informants' perspective. We prepared some general questions that served as guidance during the interviews, but these never determined the questions we finally asked.

All the interviewees accepted being recorded. That facilitated our work during the interviews as we could exclusively focus our attention to listening and understanding informants. Interviews were conducted either in Spanish or Catalan. All the interviews were conducted and transcribed by the first author. Each interview was transcribed immediately after it was conducted and always within three days of the interview. This enabled us to add our field notes regarding our impression of interviewees' body language, tone of voice, attitude, etc. The interviews were transcribed verbatim. Where the interviewee was less than articulate, we added our interpretation but left his words intact. Likewise, when during transcription we found any jargon that we did not understand, we called the interviewees and asked them for the meaning of those terms. Thus we adopted a constructivist approach to GT as we added our perception of how the interview went.

In addition to interviews, we also collected data from other sources: the minutes of meetings, internal documents, company visits, and attending meetings. These data sources complemented interview data and helped guide the sampling.

3.4 Data analysis

We followed the principle of continuous interplay between data collection and analysis. During the whole analysis, we used the computer software QSR NVivo 2.0 to organize the vast amount of information collected, and to support our coding.

3.4.1 Open coding

In GT, analysis involves the assignment of concepts and themes to the data gathered. This process, called coding, consists of fracturing, conceptualizing and integrating data to form theory. A concept is an "abstract representation of an event, object, or action/interaction that a researcher identifies as being significant in the data" (Strauss et al. 1998, p.103).

The analysis of the data began with a microscopic (sentence-by-sentence) examination of each interview (Strauss et al. 1990). The microscopic examination was the first step in the open coding process used to create initial codes for comparisons. During open coding, "data are broken down into discrete parts, closely examined, and compared for similarities and differences" (Strauss et al. 1998, p.102). We started codifying without predetermined ideas or a preconceived model. Initially, we used codes based on the terms used by informants (in vivo codes).

The iterative process of data collection, coding, and analysis gave new insights into the research, helped us to formulate new questions in subsequent interviews, and helped indicate the most appropriate informants. Codes emerged through constant comparison (Glaser et al. 1967) of instances of data when we saw that they fitted with each other. Likewise, there was a continuous feedback with informants, which allowed us to look for new informants as well as to check whether emerging concepts fitted reality.

After conducting about 15 interviews, we had already obtained 241 codes, which were grouped and organized into trees (Table 1). At this stage, we also started to conceptualize some of the open codes in the light if prior literature. For instance, in codifying the semantic interoperability conflicts that firms faced when they integrated their systems with the IOIS we used Park and Ram's (2004) classification; or in codifying the extent of use of EDI we used Massetti and Zmud's (1996) facets for EDI usage.

Coding aims to arrive at focal codes. However, we obtained many codes, which led our analysis in different directions. The reason why we obtained so many codes was that even though we compared the different instances of data, we did so in a descriptive rather than an analytical sense. We have two explanations for this: (1) our the lack of extensive and in-depth experience with GT, particularly in doing comparative analysis, and (2) the use of computer software (which on the one hand helped in organizing the codes but on the other led the researchers to focus more on descriptive coding than analytical coding). We could say that as the software greatly facilitates the management of a vast number of codes, researchers may have less incentive to work with a smaller number of abstract codes.

Table 1: Concepts that arose during open coding organized into trees

Concepts	Open Codes
Adoption	Adoption reasons (mimesis within the port community, mimesis outside the port community, sense of community, to set an example, follow the clients, have good relations with the port authority); Expected benefits (agility, simplicity, speed, less work, less time, better service, better quality of work, better planning, reliability, improve productivity, no queuing, extend working hours) ; Non-adoption reasons (scope of standard, lack of preparation); Beginning; Sunk costs; Pressure; Critical mass; Readiness; Sense of responsibility
Communication	Personal-Impersonal; Electronic channels; Fax exchange; Communication problems; Multiple channels; Paper exchange; Asynchronous
Company	Structure; Size; Scope of operations; Business; Commitment; Internal process; Customer focus; Dependence on headquarters; Location; Planning process; Relations with trading partners
Consequences	Dependence; More work; Improve service; Impact on business units; Perceived benefits; Partner relation; Return; Effects on non-integration; Side effects; Effects from bad operation; Consequences from channel duplication; Lack of coordination; Interdependent benefits; Changes of individuals work; Less data entry; Agility; Logistics; Container control; Spring effect
Implementation	Period; Post-implementation; Implementation problems; Adaptation; Testing; Training; Power
Industry	Industry competitiveness factors; Other port communities; Barriers to competitiveness; Other IOIS; Relevance; Diversity of interests; Industry association
Integration	Semantic interoperability (data representation conflict, schema isomorphism conflict, schematic discrepancy, data unit conflict, entity identifier conflict, generalization conflict); Problems with integration; Next steps with integration; Network integration; Meaning of integration; Internal integration; Interface integration; Evolution of integration; Database changes; Changes in applications; Manual integration; Changes in processes; Syntactic interoperability; Dedication; Particularities; Changes in ICT infrastructure; Automatic Integration; Path dependency; Pragmatics
IOIS	Value of IOIS; Future services of IOIS; IOIS role; IOIS perception; Problems of IOIS; Processing capacity; Strategy; Services; Pricing; Involvement in standardization; Ownership; Business model; Marketing
Message	Message analysis; Check content; Message format; Message generation; Message persistence; Message reception; Message translation; Error messages; Diversity of messages; Acknowledgement of receipt; Acknowledgement of processing; Check flow of messages; Message processing
Process	Responsibility for the process; Check status; Prior process; Physical process
Standardization	Participation; Adoption of the standard; Perception; Discrepancy; External influence; Standard committee; Visibility of information
Technical level	Technological change; Standardization of infrastructure; Database location; Software application; Connector; System in-place
Use	Problems with use; Perception form the user; Volume; Previous situation; New requirements; Aligning use; Non-use; Trading partners; Interdependence
User	Security; Attitude towards the system; Knowledge about the system; Pressure from the customer; Uncertainty; Number of users; Lack of information; Mistrust; Resistance to change; Work overload

Another important element of this GT research process has been the use of memos, which are defined as "the researcher's record of analysis, thoughts, interpretation, questions and directions for further data collection" (Strauss et al. 1998, p.110). Throughout the open coding, we wrote memos as a way to sketch and note our ideas, reflections, and concepts in parallel to data collection and open coding. The focus of our reflections was often the actual wording or formulation used by interviewees, which we then interpreted during the analysis. Whilst memoing, we immersed ourselves in the data so that we embedded the narrative of the participants in the research outcome.

3.4.2 Axial and selective coding

Once we had the codes organized into trees (Table 1), we moved into 'axial coding' in our quest for a higher level of conceptual abstraction but in the process got lost in the data. Given the amount of codes we obtained during open coding, as well as their different levels of abstraction, we found difficulties in (1) reassembling these codes, (2) looking for code properties, (3) specifying relationships between those codes, and (4) finding an underlying story in them. We therefore decided to change our coding strategy. We repeated the analysis of all the interviews and other sources but this time abstaining from generating new codes, and focusing instead on writing memos in order to develop a picture of what the data meant in a

broader sense. Two general questions guided this analysis: (1) what is happening in the data?, and (2) what patterns are occurring in the data?. Reviewing the memos from the previous stage proved particularly useful in answering them. During the axial coding we organized and combined the initial memos with the new ones and we wrote a paper (Rodon et al. 2006), which served as a preliminary presentation and validation of the findings of the research.

At the same time, we adopted a new perspective towards the analysis of data: the paradigm model (Strauss et al. 1990), which is a tool to help contextualise the phenomenon by modelling the action and interaction strategies of the actors. Strauss and Corbin (1990) suggest using a coding family that consists of causal conditions, the phenomenon, the contextual conditions, the intervening conditions, the interactional strategies, and the consequences of these. We applied the paradigm model to our data and obtained the model in Figure 2. However, we considered that this model was a snapshot of the IOIS implementation rather than one which revealed the dynamics of the process.

We then examined how other IS papers (Crook et al. 1998; Esteves et al. 2003) had applied the paradigm model. However, these authors had also used it to give a static picture of the phenomenon. For instance, Esteves et al. (2003) used it to present the factors that affected the implementation of an ERP, and Crook et al. (1998) used it to develop a theoretical model of EDI use.

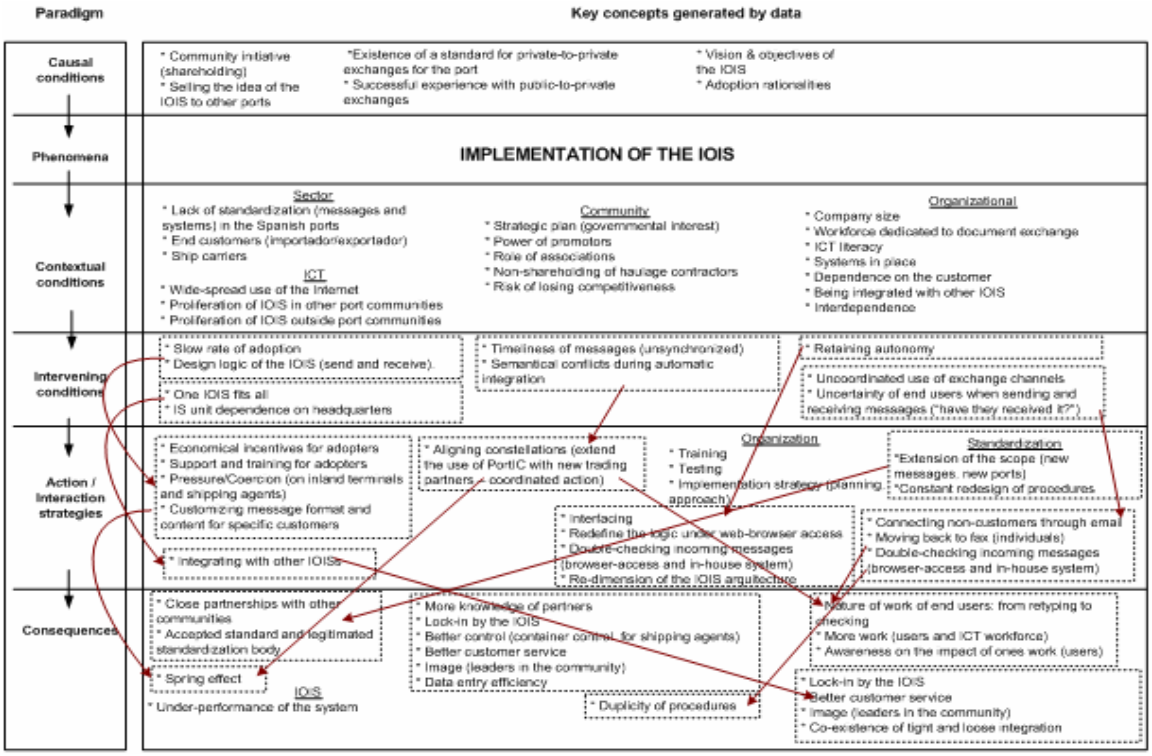

Figure 2: Paradigm model

As we were interested in a more dynamic view of the implementation of the IOIS, we decided to adopt a simplified version of the paradigm model developed by Strauss and Corbin (1998), which consists of conditions, action/interaction, and consequences. Strauss and Corbin (1998) regard a process "as a series of evolving sequences of action/interaction that occur over time and space, changing or sometimes remaining the same in response to the situation or context" (Strauss et al. 1998, p.165). Actions, which occur in response to changes in the context, may be "strategic" when they are "taken in response to problematic situations", or "routine" when they are "carried out without much thought" (Strauss et al. 1998, p.165). That is, the authors conceptualize the process in terms of sequences or shifts in the nature of action and interaction between actors. Accordingly, rather than looking for properties of each code, which is what we initially tried to do in the axial coding, we purposely looked at action and noted "movement, sequence, and change as well as how it evolves…in response to changes in context or conditions" (Strauss et al. 1998, p. 167).

As our analysis of the empirical data on the basis of conditionsà actionsà consequences moved forward, our initial research question also changed and became more focused. We realized that the data gathered were telling stories concerning not only the problems that firms faced when integrating their systems with the IOIS or when using the IOIS in their daily work, but also the IOIS managers' actions in helping users adopt the

IOIS. Thus our research problem shifted from how the integration of pre-existing systems with the IOIS unfolded, to how IOIS management acted during the implementation process. We realized that the IOIS management acted to modify existing context –e.g. lack of use of the IOIS– or the consequences of their previous actions to adjust the IOIS to its adopters' environment.

Then we found five categories in our data which we interpreted as manoeuvres that managers of the IOIS made to support the integration of the adopting firms' systems with the IOIS and to enhance the use of the IOIS. Following the analysis, we collected further data in order to validate these results and to reveal new types of managerial actions. The five categories that emerged were: "Maintaining adopters' autonomy", "Accommodating to unintended uses", "Managing the coexistence of exchange channels", "Agreeing on the operational use of the system", and "Balancing the degree of integration". We ended data collection when analysis revealed similar incidences and events occurred over and over again. Further data collection would therefore have added nothing to these five categories. In the end, 27 interviews were conducted over a 9-month period (March 2005-November 2005).

The five categories were subsumed into a core category: "Managerial action in the implementation of an IOIS", which was the basis for the emergent theory. This core category concerns the set of found actions that managers performed to support the integration of adopters' pre-existing systems with the IOIS and to enhance the use of the IOIS.

3.5 Diagramming: Presenting the findings

In GT, the illustration of the theory is done mainly during axial and selective coding, when categories are created and related. Besides memos, Strauss and Corbin (1998) also suggest the use of diagrams as a tool to gain analytical distance from materials and to present the results. Diagrams are useful to sort out the relationships between categories that arise during axial and selective coding. Strauss and Corbin (1998), however, do not propose a systematic way of presenting diagrams or of integrating them in GT, suggesting instead, that the "analyst has to develop his or her own style and techniques" (Strauss et al. 1998, p.223). In order to make up for GT's lack of illustration techniques, we used action diagrams (Axelsson et al. 2004) to structure and report on the five salient categories that emerged from the coding process. Action diagrams helped us graphically represent the categories that emerged from applying the simplified version of the paradigm model (Strauss et al. 1998).

In the action diagrams (see Figure 3 and Figure 4 for an example) the diverse components of each category are related to each other as causal-pragmatic relationships. This means that the links between the different components in the diagrams are not deterministic, rather they are the result of interpretations of the actors (Axelsson et al. 2004). In the diagrams, we use different labels to indicate the role of each component within the diagram, such as conditions, actions –performed by the IOIS management– and consequences. Conditions refer to the set of circumstances, situations or assumptions, in which the implementation is embedded. We focus on the conditions that managers consider lead up to a problem or opportunity for the development and use of the IOIS. An action (or agency) refers to the stream of actual causal interventions of managers in the ongoing process of events-in-the-world (Giddens 1976). Conditions and actions are related as the formers may "explain why and how persons or groups respond in certain ways" (Strauss et al. 1998,p .130). Finally, consequences, which refer to the results from action, may be intended or unintended, and primary or secondary. An unintended consequence arises when an action that is performed with the intention of producing one consequence produces a different one, which can be conflicting, negative or positive. A primary consequence is the immediate intended result of an action. A secondary consequence is the result of a primary consequence, and can be either intended or unintended.

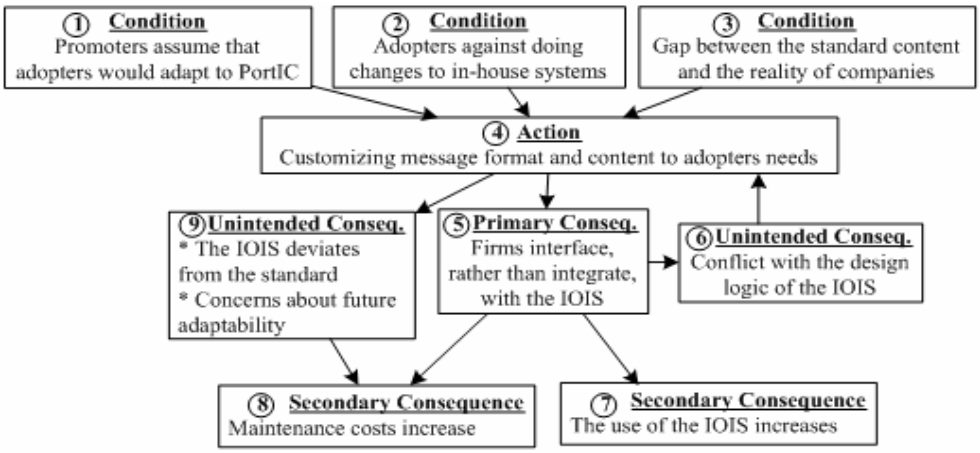

Figure 3: Action diagram for the category "Maintaining adopters' autonomy" (Rodon et al. 2007a)

1, 2 and 3. Conditions. There was a common belief among the promoters of the IOIS that adopters would introduce organizational changes to take advantage of the IOIS when they integrated with it. However, most of the firms in the study merely saw the IOIS as a glorified mailman, which received messages and forwarded them on to the right target. From the outset, the organizations in the study did not introduce changes in their organizational structures, and avoided making changes in their internal physical and documentary processes. They saw the IOIS as a tool that simply replaced the fax or former EDI systems they had, and they were not willing to implement any change to their business processes. Moreover, some firms complained about the flows and content of some of the messages initially defined in the standard and implemented by the IOIS. They considered those business processes differed from their in-house business processes.

4. Action. Then the standardization committee and the company managing the IOIS decided that the standard and the IOIS would adapt to the demands of adopters. For instance, in the case of exports, the standardization committee members agreed that truck drivers would not need to show any paper-based documentation to enter the inland terminal providing that the hauler had previously specified the driver in electronically submitted 'pre-arrival notification'. However, once the IOIS had implemented the procedure, inland terminals objected to it arguing they had never worked that way. Then the IOIS made some changes, which lay outside standard's scope, to persuade inland terminals.

5. Primary Consequence. This accommodation of the IOIS to adopters needs allowed the latter to avoid making changes to their business processes and databases. Interoperability was mainly accomplished through conversion tables but never by changing their data models.

6. Unintended consequence. Once firms started interfacing with the IOIS, they realized they required information to complete messages that was not always stored in their databases. However, the design logic behind the IOIS had been that of a virtual clearing house. The IOIS stored data from incoming messages and forwarded them to the specified target. That meant that, in some cases, firms were forced to store data from incoming messages that they had never used before but that they required in order to complete a message they had to generate later. These firms considered that although from the outset they had agreed with the design logic of the IOIS, they later realized it should have been different.

In such case, the IOIS could add some value if it avoided firms retyping some data that they did not have at that moment or which they had already previously sent (action 3). Later, the IOIS accommodated to this requirement.

7 and 8. Secondary (intended) consequences. A secondary consequence of the action was that some firms, which had agreed to integrate with the IOIS several years before but had never been active users, boosted the use of the system. There was an increase in the number of messages exchanged. On the other hand, the maintenance costs of the IOIS increased as more customizations were implemented.

9. Unintended consequence. As some of the changes made by the managers of the IOIS had not been approved by the standardization committee, the IOIS implemented some procedures that deviated from what the standard laid down. Moreover, the customization of the IOIS to current customers has diminished the capacity of the IOIS to adapt to future changes. In addition, maintenance costs of the IOIS have increased (secondary consequences 7) given that any new measure approved by the standardization committee requires customization of the IOIS support.

Figure 4: Description of the action diagram "Maintaining adopters' autonomy" (adapted from Rodon et al. (2007a))

3.6 Theoretical matching and generation

Once the five categories emerged, we began scrutinizing the IS and management literature for models, frameworks, or theories that might be relevant to our findings and thus enhance the theoretical sensitivity of

our study. On the one hand, based on our initial IOIS literature review, we were aware that the role of management in the process of IOIS implementation was an unexplored area in the IOIS literature. On the other hand, we presented our findings in workshops and research seminars, from which we got feedback that helped us in our quest for theoretical sensitivity. We then confronted the five categories that emerged from the analysis with three other streams of literature: misalignments (Leonard-Barton 1988), organizational change (Orlikowski et al. 1997), and emergent strategy (Mintzberg 1994).

Organizational change literature (Orlikowski et al. 1997) tells us that when it comes to daily operations, IOIS management has to deal with emergent changes –i.e. unexpected user appropriations of the system. Such emergent changes create unforeseen conditions and reveal misalignments (Leonard-Barton 1988), which trigger managers to perform adaptive responses (opportunity-based changes) in order to reinforce or attenuate them; in turn, as managers respond, new unintended outcomes and changes may emerge. We group the adaptive responses that arose from the case into five managerial manoeuvres (our five categories). Finally, we observe that these manoeuvres converge into two strategies in action (also referred to as emergent strategies (Mintzberg 1994)): attract users to bootstrap the IOIS, and keep the IOIS adaptable. As a result we obtained the model in Figure 5.

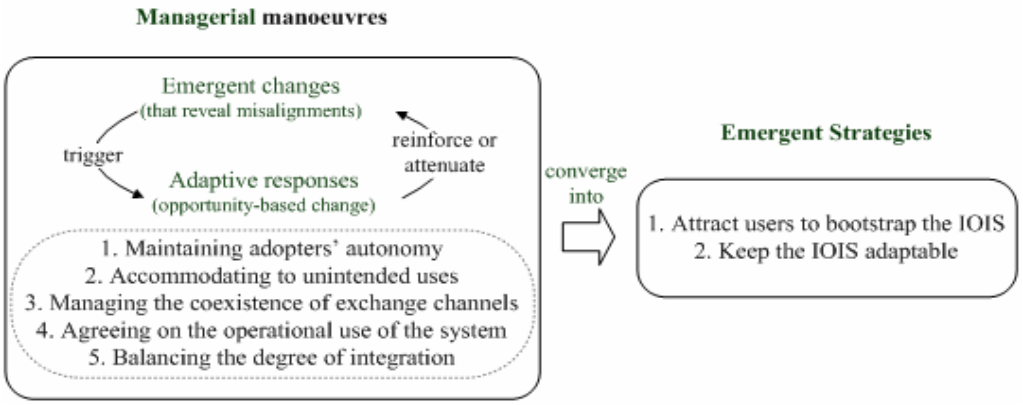

Figure 5: Process model that shows the emerging theory (adapted from Rodon et al. (2007a))

Through theoretical matching and generation we were able to (1) adapt the results of the GT study, and (2) provide a model that complements prior IOIS literature on whether the implementation process goes according to a plan and use of the IOIS meets expectations. Our model, which is grounded in the behaviour, words and actions of a set of professionals in a specific context, offers a plausible explication of the phenomenon under study. It is a process model that emphasizes the role of misalignments, and emergent changes during IOIS implementation, and depicts how management can cope with them.

4. Discussion and conclusion

Having conducted the aforementioned GT case study, we should like to highlight the following points, which emerged from our experience:

- Having some knowledge about the research setting and the research problem before a GT research starts is advisable. By conducting several empirical studies before we started the GT study, we were able to quickly immerse ourselves in the research context, which helped us define the initial sampling and minimize the jargon problems during the analysis. In addition, although we conducted a literature review prior to starting the GT study, we did not formulate any hypothesis or theoretical models. The reason was that one of the outcomes of the review was that our research problem had not been tackled by prior studies. The literature review also proved useful in the later stages of the research process by helping us enhance the theoretical sensitivity and grasp novel findings when they emerged.
- At the outset of open coding, analysis was unfocused. We did not have a clear idea of what they were looking for so they focused more on code generation than analysis. We obtained a large amount of open codes, which greatly increased the complexity of the data analysis. Likewise, we found difficulties in scaling up the codes into more abstract codes, in finding properties and categories, and in giving names to codes. Sometimes the names we used were too abstract, thus they lacked precision; other times, the names were too tied to the data and they thus lacked the status of a concept (Strauss et al. 1998). We consider that a researcher's overemphasis on identifying codes without relating them and developing theoretical codes (Allan 2002) is a normal and sometimes inevitable pitfall in the initial stages of the analysis, especially when the research

question and objectives are very open, and the researcher is fairly unfamiliar with GT. Doing open coding at the right level of abstraction requires certain experience and practice with the research setting and with GT. As our case shows, we had some knowledge about the research setting, and we were able to overcome our lack of practice in the later stages of the coding process.

- The researcher has to approach coding with an open mind, flexibility, and creativity. First, coding has to be performed as much as possible without predetermined ideas. The researcher has to keep an open mind when making sense of the data. He has to avoid looking for confirmation, in the data gathered, of any pre-conceived ideas he may have had before. Moreover, the researcher usually starts coding with a vague idea of the research problem and question. Later on, as the research process moves forward, the researcher is able to pin down the research question.
- Second, although the process of creating categories is mainly creative, the categories have to be grounded in data. In our case, even though during axial coding we coded all the data gathered again from scratch, the open codes and especially the memos written during open coding helped during axial coding by facilitating our abstraction process. Memos and diagrams became a relevant vehicle for our creativity.
- Third, researchers should approach coding with flexibility. As Strauss and Corbin (1990) recognize, researchers have to be flexible in the sense that “while we [Strauss and Corbin] set these procedures and techniques before you, we do not wish to imply rigid adherence to them" (p. 59). It is the interpretation and flexibility of the researcher what really matters. Therefore, although GT provides with a set of procedures for coding, comparing, categorizing, etc, which may seem quite mechanical, the analytical process is highly interpretive by nature and fairly flexible to use.
- Theoretical sensitivity and matching occurs at two levels. At one level, theoretical sensitivity is enhanced by constantly reading in the same and other areas of research. At the other level, the development of concepts directs researcher’s attention to specific literature. For the latter to occur, it is useful to share one’s findings with colleagues from one’s own field or others. Workshops and conferences are just two settings in which findings might be shared. In our case, we started incorporating external literature once the five categories started emerging.
- Finally, a GT study is very time and resource-consuming, especially the processes of transcription, codification and constant comparison, thus any tool that supports the research is advisable. For instance, computer software may ease the process of cross-checking code generation; that is, they reduce the clerical work. Likewise, in our case the software facilitated the writing process as it was easy to browse the large number of codes we obtained. However, these tools are no substitute for the researcher making sense of the data given that abstractions are mental activities which cannot be formalized (Goulding 2002).

As we have mentioned earlier, the use of computer software led us to focus on descriptive coding rather than analytical coding (Strauss et al. 1998). Because this type of software is designed to facilitate data handling, inexperienced researchers tend to overemphasize code generation rather than abstraction. Although we consider computer software to be very useful throughout the research process, it cannot replace intuition and abstraction of the researchers or their need to make judgement (Hunter et al. 2005).

This paper has presented our personal experiences in conducting a GT case study that follows the Straussian approach. We describe the research process by focusing on the problems, decisions and paths taken throughout the process. We consider this paper provides a practical understanding of how the Straussian version of GT can be applied and which may serve as guidance for novice researchers. The paper also shows how we applied the paradigm model (Strauss et al. 1998) in order to develop a process model of IOIS implementation, and gives some novel ideas on how to report on and present the results of GT studies that adopt the paradigm model.

References

Allan, G. (2002) "A critique of using grounded theory as a research method," Electronic Journal of Business Research Methods, Vol. 2, No. 1, pp. 1-10.

Applegate, L.M., Neo, B.-S., and King, J. "Singapore TradeNet : Beyond TradeNet to the Intelligent Island," Harvard Business School Publishing, 1995, pp. 1-14.

Applegate, L.M., Siong, N.B., Bartlett, N., and Chang-Leow, D. "PSA: The World's Port of Call," Harvard Business School Publishing, 2001, pp. 1-34.

Axelsson, K., and Goldkuhl, G. (2004) "Theory Modelling - Action Focus when Building a Multi-Grounded Theory," 3rd European Conference on Research Methods in Business and Management, Reading, UK, pp. 1-11.
Baalen, P.v., Oosterhout, M.v., Tan, Y.H., and Heck, E.v. (2000) Dynamics in Setting Up an EDI Community, Eburon Publishers, Delft, The Netherlands.
Blumer, H. (1969) Symbolic Interactionism: Perspective and Method, University of California Press, Berkeley.
Crook, C.W., and Kumar, R.L. (1998) "Electronic data interchange: a multi-industry investigation using grounded theory," Information & Management, Vol. 34, No. 2, pp. 75-89.
Damsgaard, J., and Lyytinen, K. (2001) "Building Electronic Trading Infrastructures : A Public or Private Responsability?," Journal of Organizational Computing & Electronic Commerce, Vol. 11, No. 2, pp. 131-151.
Eisenhardt, K.M. (1989) "Building theories from case study research," Academy of Management Review, Vol. 14, No. 4, pp. 532-550.
Elgarah, W., Falaleeva, N., Saunders, C., Ilie, V., Shim, J.T., and Courtney, J.F. (2005) "Data exchange in interorganizational relationships: review through multiple conceptual lenses," The DATA BASE for Advances in Information Systems, Vol. 36, No. 1, pp. 8-29.
Esteves, J., Pastor, J.A., and Carvalho, J. (2003) "Organizational and National issues of an ERP Implementation in a Portuguese Company," IFIP 8.2+9.4 conference, Athens, pp. 139-154.
Fernandez, W.D. (2004) "Using the Glaserian Approach in Grounded Studies of Emerging Business Practices," Electronic Journal of Business Research Methods, Vol. 2, No. 2, pp. 83-94.
Giddens, A. (1976) New Rules of Sociological Method, Stanford University Press, Stanford.
Glaser, B.G. (1992) Emergence vs. Forcing: Basics of Grounded Theory, Sociology Press, Mill Valley, CA.
Glaser, B.G., and Strauss, A.L. (1967) The Discovery of Grounded Theory: Strategies for Qualitative Research, Aldine Publications Company, New York.
Goulding, C. (2002) Grounded Theory: A Practical Guide for Management, Business and Market Researchers, SAGE Publications Ltd, London.
Hock-Hai, T., Bernard, C.Y.T., and Kwok-kee, W. (1997) "Organizational Transformation Using Electronic Data Interchange : The Case of TradeNet in Singapore," Journal of Management Information Systems, Vol. 13, No. 4, pp. 27.
Hunter, K., Hari, S., Egbu, C., and Kelly, J. (2005) "Grounded Theory: Its Diversification and Application Through two Examples From Research Studies on Knowledge and Value Management," Electronic Journal of Business Research Methods, Vol. 3, No. 1, pp. 57-68.
Latour, B. (1987) Science in action: how to follow scientists and engineers through society, Harvard University Press, Cambridge, MA.
Leonard-Barton, D. (1988) "Implementation as mutual adaptation of technology and organization," Research Policy, Vol. 17, No. 5, pp. 251-267.
Lyytinen, K., and Damsgaard, J. "What's wrong with the Diffusion of Innovation Theory?," in: Diffusing Software Products and Process Innovations, M.A. Ardis and B.L. Marcolin (eds.), Kluwer, B.V., Deventer, The Netherlands, 2001, pp. 173-190.
Massetti, B., and Zmud, R.W. (1996) "Measuring the extent of EDI usage in complex organizations: Strategies and illustrative examples," MISQ Quarterly, Vol. 20, No. 3, pp. 331-345.
Mills, C.W. (1959) The Sociological Imagination, Oxford University Press, New York.
Mintzberg, H. (1994) The Rise and Fall of Strategic Planning, Prentice Hall, Hertfordshire.
Myers, M.D. (1997) "Qualitative research in information systems," MISQ Quarterly, Vol. 21, No. 2, pp. 241-242.
Orlikowski, W.J. (1993) "CASE Tools as Organizational Change : Investigating Incremental and Radical Changes in Systems Development," MIS Quarterly, Vol. 17, No. 3, pp. 32 (309-340).
Orlikowski, W.J., and Hofman, J.D. (1997) "An Improvisational Model for Change Management: The Case of Groupware Technologies," Sloan Management Review, Vol. 38, No. 2, pp. 11-24.
Park, J., and Ram, S. (2004) "Information Systems Interoperability: What Lies Beneath?," ACM Transactions on Information Systems, Vol. 22, No. 4, pp. 595-632.
Ramanathan, S., and Rose, J. (2003) "Rationalizing, Probing, Understanding: the Evolution of the Inter-Organizational Systems Adoption Field," Hawaii International Conference on Systems Science, IEEE Computer Society, Big Island, pp. 254-263.
Rodon, J. (2003) "PortIC: The Electronic Trading Infrastructure of The Port Community of Barcelona," North American Case Research Association (NACRA), Tampa, Florida.
Rodon, J. (2006) "Methodological and Conceptual Review of Inter-Organizational Information Systems Integration," 14th European Conference on Information Systems, Göteborg, pp. 1-12.
Rodon, J., Pastor, J.A., and Sese, F. (2007a) "The Role of Emergent Strategies in Managing the Implementation of an Industry IOIS," 67th Academy of Management Annual Meeting, Philadephia.
Rodon, J., and Ramis-Pujol, J. (2006) "Exploring the Intricacies of Integrating with a Port Community System," Bled eConference, Bled, Slovenia, pp. 1-15.
Rodon, J., Ramis-Pujol, J., and Christiaanse, E. (2007b) "A process-stakeholder analysis of B2B industry standardisation," Journal of Enterprise Information Management, Vol. 17, No. 1, pp. 83-95.
Strauss, A.L., and Corbin, J. (1990) Basics of Qualitative Research. Grounded Theory Procedures and Techniques, Sage, Newbury Park, CA.
Strauss, A.L., and Corbin, J. "Grounded Theory Methodology," in: Handbook of Qualitative Research, a.Y.S.L. Norman K. Denzin (ed.), Sage Publications, 1994, pp. 273-285.
Strauss, A.L., and Corbin, J. (1998) Basics of qualitative research : techniques and procedures for developing grounded theory, Thousand Oaks, CA: Sage.

Urquhart, C. "An Encounter with Grounded Theory: Tackling the Practical and Philosophical Issues," in: Qualitative Research in IS: Issues and Trends, E. Trauth (ed.), Idea Group Publishing, Hershey, 2001, pp. 104-140.
Wrigley, C.D., Wagenaar, R.W., and Clarke, R.A. (1994) "Electronic Data Interchange in international trade : frameworks for the strategic analysis of ocean port communities," Journal of Strategic Information Systems, Vol. 3, No. 3, pp. 211-234.

