

Research Philosophies in the IOS Adoption Field

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Abstract

This paper pursues two objectives. First it depicts the status of research philosophies of the IOS adoption field. Second, it gives an overview of the discussions within the field of IS about interrelating research philosophies and analyzes to which extent this has happened in the IOS adoption field thus far. In depicting the philosophical status of the field we apply Orlikowski and Baroudi's (1991) framework that classifies IS research as relying on a foundation of assumptions from either positivism, interpretivism or critical theory. We found the framework well suited for our review of the field, although we did not find any instances where critical theory had been used as the basic assumption in an IOS adoption study. Our findings show that there are several clear openings for contributions that apply new research perspectives to the field of IOS or combine multiple research perspectives for added insight into the dynamics of IOS adoption.

Keywords

IOS, inter-organizational systems, research philosophies, scientific progress, positivism, interpretivism, critical theory

1. Introduction

This paper presents an analysis of the progression of science with the field of adoption of inter-organizational systems (IOS) from the field's inception in the mid 1980s until the present day. We have conducted an extensive review of IOS adoption related articles and analyzed their research philosophies, i.e. the underlying ontology and epistemology as well as the methodology applied. We take this perspective to ensure a depth/relevance in the analysis, which we believe has been lacking in previous work.

Chua (1986) presented a framework for analyzing research approaches in his field of accounting. The framework classifies research philosophies as under three which are i)

positivist ii) interpretive and iii) critical. Each of the philosophies are detailed further as under assumptions, beliefs about physical and social reality, beliefs about knowledge (includes both epistemology and methodology), beliefs about theory and practice and through an empirical example. Orlikowski and Baroudi's (1991) later adopted the framework for analyzing the field of IS. In so doing they applied the framework to articles from a broad range of subjects, but from a small number of publication outlets.

Our work is distinct from previous work (Lee 1991; Orlikowski and Baroudi 1991; Landry and Banville 1992; Benbasat and Weber 1996; Lee 1999; Mingers 2001) in three ways. First, we analyze scientific progression in a narrowly defined IOS adoption field rather than attempt an analysis of such a wide field as all of IS as we feel that such wide scope analyses necessarily lead to broad, conceptual arguments that are not easily applicable for new research projects. In contrast, we are able to depict the specifics of scientific progression in the field and support our arguments with a number of concrete findings and citations within a narrow focus. Second, traditional literature reviews are based on a selection of a small number of recognized publication outlets for a period of time (e.g. Orlikowski and Baroudi (1991) and Cheon et al. (1993)). The disadvantages of such an approach are i) the list of chosen outlets is often disputed and ii) more importantly, publications in conferences and lesser deemed journals that have contributed to the scientific development are left out. We have applied a more comprehensive sample selection approach that includes publications within the field from as early as 1966 (Kaufman 1966) to as recent as 2002 (Kurnia and Johnston 2002) from journals, conferences, and book chapters. The process that we adopted for selecting the literature sample is explained in the methodology section. Third, we support our analysis with the very details of scientific progression synthesized from literatures in the IOS adoption field. This is in contrast with previous work where progression has been analyzed by studying a few static variables. E.g. Orlikowski and Baroudi (1991) identify positivism as the dominant research paradigm by reviewing 155 articles in the IS field, and Cheon et al. (1993) test generic variables such as "research methods" and "research types" for explaining IS maturity. These studies however provide little insight about the dynamics of progression. We hold that insight into the dynamics is important for making predictions and daring to be normative about the future of a research field.

The remainder of the paper is organized as follows. Section two presents the process by which we selected our sample of papers for the review. Section three presents the research philosophy framework (Chua 1986; Orlikowski and Baroudi 1991) and analyzes the reviewed papers as under each of the three research philosophies. This is followed by a holistic discussion of the analyses, and finally section five concludes the paper where we sum up our findings and identify promising avenues for further research.

2. Review Process

A sample of 73 papers that study IOS adoption was analyzed for a review of the IOS adoption field. This review is documented in detail in a separate paper (Somasundaram and Rose 2003). The present paper extends the analysis of the literature review. The papers in the sample were classified as under positivist, interpretive or critical philosophies. Then, the scientific progression as under each of the philosophies is analyzed. A discussion about the state of and the prospect of inter-relating philosophies in the IOS adoption field follows.

We arrived at the sample using the snow-balling technique. Moriarty and Bateson (1982) define the use of snow-balling techniques for arriving at a sample. They present three snow-

balling techniques which are i) single-stage snowball ii) multiple-stage snowballing and iii) exhaustive snowballing. We have applied the exhaustive snowballing which prescribes following all leads obtained in the first sampling stage to reach a sample for the second stage, and continuing this process until no new leads are generated.

We relied on four papers across time-period as our starting points. They are i) a review paper by Kurnia and Johnston (2002) where the authors evaluate the emergence of process oriented research in the IOS adoption field ii) a paper by Damsgaard and Lyytinen (1998) which calls for a processual and multi-level analysis iii) a classic factor based research by Hart and Saunders (1997) and iv) one of the first instances of theorizing in the IOS area by Bakos and Treacy (1986). We followed the literature lists in the four above mentioned papers (first stage snowballing), but thoroughly read only those that studied IOS adoption at the organizational and inter-organizational level of analysis. Then we followed the literature list of the second round of papers further and so on until we found no new papers. We did not adopt citation search for arriving at our sample because the term “adoption” is often confused with the terms “diffusion” and “implementation”. Furthermore, the results that we got did not fit into our restricted focus when we searched ABI/Inform using the following key words: IOS, adoption, organization and inter-organization. Had we chosen to arrive at the sample using key word search, we would have ignored the research work (prior to Bakos and Treacy (1986)) where IOS adoption is indirectly studied under the key words “IT” and “competitive advantage”. Apart from the IOS adoption papers, we also reviewed related conceptual papers such as that of Cooper and Zmud (1990) where adoption is defined as a stage in the implementation process, and Kumar et al. (1998) where trust and co-operation are identified as the third underlying rationality.

The discussion under each of the philosophies serves two purposes. Firstly, it temporally explains the progression in the IOS adoption science within each philosophy strand. Secondly, it analyzes the consistency with which the science has progressed within each strand. We evaluate the possibility of interrelating philosophies in the IOS adoption field in the discussion section.

3. Orlikowski and Baroudi’s Framework Applied to IOS Adoption Research

Orlikowski and Baroudi (1991) discuss a range of philosophical assumptions available to study IS phenomena in order to “encourage greater debate and mindfulness around the approach we adopt when we embark on research investigations”. They operationalize this objective by adopting Chua’s (1986) classification of research epistemologies as either i) positivist ii) interpretive or iii) critical studies. While Orlikowski and Baroudi use Chua’s classification mainly to discuss a range of philosophical assumptions per se, we use this classification for analyzing the application of these philosophical assumptions in the IOS adoption field. We rely upon our literature survey data for conducting our analysis and the following discussion.

3.1 Positivist Philosophy in IOS Adoption Research

The central principles of positivist philosophy as identified from Orlikowski and Baroudi (1991) are

- i. The world that we study is “objective” and exists “independent of humans”.
- ii. The researcher’s duty is to explain this “physical and social world” through universal laws or principles.
- iii. Deductions made from the laws or principles can be used to explain “events or actions”. When aware of the laws or principles researchers can predict and control events or actions.

The rigor, validity and replicability criteria for conducting and evaluating research according to this philosophy have been institutionalized in the field of IS since its origin of the hardware disciplines of systems construction. All of our surveyed work published in renowned outlets until the mid 90’s apply positivist philosophy.

Orlikowski and Baroudi (1991) epistemologically classify the positivist papers in their review sample as either i) descriptive or ii) theoretically grounded. The ratio of descriptive to theoretically grounded papers in their sample of 155 papers is approximately 1:3. Their work does not account for the time at which descriptive and theoretically grounded papers were published. Our analysis shows a similar approximated ratio between the descriptive and theoretically grounded work in the positivist IOS context. IOS adoption emerged as a field from the descriptive work as the impact of IOS is implicitly discussed under the “IT and competitiveness” umbrella based on anecdotal evidence. Most of the descriptive work is published in the mid 1980’s. Bakos and Treacy (1986) along with a few others (e.g. Clemons and Kimbrough (1986)) lay the base for a theory based cumulative tradition highlighting the then descriptive and anecdotal nature of the research. The volume of published descriptive work gradually decreases from this time as theoretically grounded papers become main stream.

The well established ideology of logical empiricism is used as the logic for cumulating research work in the positivist perspective by theory refinement through falsification. The theoretically grounded IOS papers implement logical empiricism in a standardized pattern that resembles framework development through: established findings – sample selection – statistical analysis – findings and discussion.

The IOS adoption field has had difficulties in arriving at a standard, encompassing research framework or theory. There are, however, a few influential frameworks for studying IOS adoption that are frequently quoted in the literature, such as an empirically derived detailed adoption model (Grover 1993), a small business adoption model (Iacovou, Benbasat et al. 1995), an EDI adoption and use model (Hart and Saunders 1997) and a research model (Premkumar, Ramamurthy et al. 1997). Researchers following this ideology usually select one of these frameworks, in many cases adapt it to suit their situation (e.g. (Heck and Ribbers 1999)) and test its applicability. The papers in our sample show a variety of sampling sizes and techniques with sample sizes ranging from 100 phone calls (Cooper and Zmud 1990) to 5000 questionnaires (O’Callaghan, Kaufmann et al. 1992), and return rates ranging from 11.6% in a double-round survey study (Bergeron and Raymond 1992) to 62% in a phone survey where the participants had agreed in advance to participate. Figure 1 presents a

summary of the number of usable responses in the quantitative positivist studies in our sample.

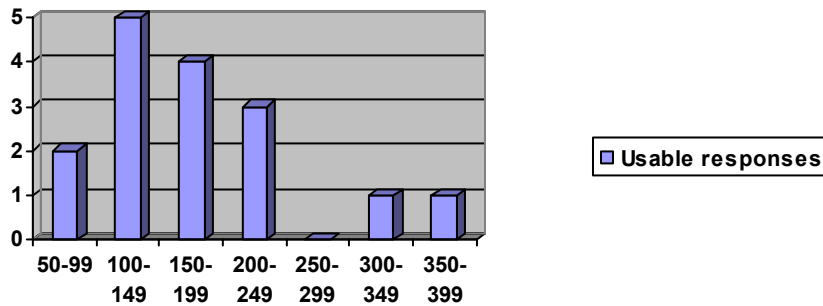


Figure 1. Usable responses in quantitative positivist studies in our sample

A model gains acceptance and becomes a standard explanatory model for IOS adoption when it passes the falsification test in a large number of studies. No model has yet been tested enough for it to emerge as the one standard model. Moreover, the cumulative knowledge development has been hampered by inconsistent findings between studies. For example, while Iacovou et al. (1995) and Grover (1993) find relative advantage as having a positive impact on IOS adoption, Premkumar et al. (1995) and Saunders et al. (1992) do not find a significant relationship.

It is not just the independent variables and their relationship with the dependent variable that vary among models. The dependent variable itself varies as well. The dependent variables that have been studied include the following:

- i. Intent/decision to adopt
- ii. Rate of adoption
- iii. Extent of adoption
- iv. Internal effects of adoption
- v. Proactive vs. reactive decision mode for adoption
- vi. Timing of adoption

While this shows the richness of IOS adoption studies, it is important to recognize the implications of such diversity in cumulative knowledge development.

The positivist philosophy is criticized for overly abstracting or oversimplifying the complex IOS phenomena through a few unilateral relationships. Damsgaard and Lyytinen (1998) mention that unlike simple innovations such as television sets, IOSs represent a rich and complex technology whose adoption happens over a period of time as a result of interactions among multiple parties. Thus they deem the factor based approach with its snapshots of adoption processes as inadequate for richly explaining the complex IOS adoption phenomena.

3.2 Interpretive Philosophy in Inter-Organizational Systems (IOS) Adoption Research

The central principles of interpretive philosophy as identified from Orlikowski and Baroudi (1991) are

- i. The world/reality is not objective; instead it is presumed to be socially constructed.
- ii. A researcher's role is to understand the inter-subjective meanings embedded in social life and explain the actions of those constructing the reality.
- iii. While this approach is appropriate for studying complex phenomena in depth, it is restrictive regarding breadth/generalizability.

The interpretive philosophy has been gaining acceptance among the larger IS community in the recent years. In 1993 the high-ranking IS journal MIS Quarterly explicitly changed its editorial policy to include interpretive research work (DeSanctis 1993 quoted in Walsham (1995)). However, tools and techniques for carrying out interpretive studies have not yet reached the same widespread use as their positivist counterparts. Only a few institutions, mostly European based, provide training in using interpretive tools and techniques. Table 1 illustrates the historical dominance of positivist research philosophy in our sample, and figure 2 illustrates the development over time as interpretivist studies gain acceptance in the scientific outlets.

| Research philosophy | Frequency | Percent |
|--------------------------|-----------|-------------|
| Positivist | 56 | 76.7 |
| • “descriptive” | (26) | (35.6) |
| • Theoretically grounded | (30) | (41.1) |
| Interpretive | 17 | 23.3 |
| Critical | 0 | 0 |
| Total | 73 | 100% |

Table 1. Articles classified by research philosophy (modeled from Orlikowski & Baroudi (1991))

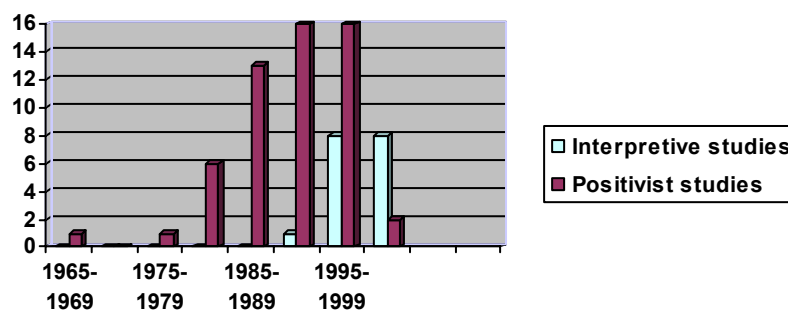


Figure 2. Distribution of positivist and interpretive studies in our sample over time

One of the first published works that applies interpretive philosophy in the study of IOS adoption is the work of Damsgaard (1997). He categorizes his field study data into diffusion patterns for demonstrating the complex nature of EDI. The appropriateness of using this process approach for studying IOS adoption is analyzed in depth by Kurnia and Johnston (2000; 2001). They argue that a factor based approach is inadequate for studying the complex IOS adoption process. Capability of organization, nature of technology and external factors do not uni-directionally determine the action that leads to the adoption of IOSs. Instead, the adoption of an IOS is seen as an interactive process where the causal notion is bi-directional in nature; the factors affect the adoption of IOS and get affected in the process. It is inadequate just to study the causal notions at the organizational level. Instead the effects of industry and remote environment in the adoption of IOS are also to be understood. Finally, the IOS adoption is not an instantaneous act, but one that takes place over a period of time. Hence, longitudinal studies that study the dynamics of interactions are preferred over snapshot factor based approaches.

Orlikowski and Baroudi (1991) extend Chua's framework by classifying interpretive researchers as under two categories; "weak" and "strong" constructionists. Researchers adopting the weak constructionist view attempt to provide an intuitive explanation of an act or an experience. In the strong constructionist view, the neutrality of the researcher in providing an unbiased descriptive account is questioned. Thus, the researcher is expected to analyze the influences of his or her biases on the descriptive accounts provided. The "strong" constructionist philosophy is argued as a replacement for the positivist unlike the "weak" view which is touted as complementing the positivist.

Our research shows two schools of thoughts among the papers that study IOS adoption from an interpretive philosophy. Both of them fall under the "weak" constructionist category and they both encourage the researcher to approach the context with a framework in mind, with the objective of the study being refinement of the framework. The differences however arise from their beliefs about the extent to which factor based approaches can explain IOS adoption. Those in the first school of thought (Kurnia and Johnston 2000) who are aligned closer to the positivist philosophy view their interpretive work as a 'second-order' model that details the dynamics of interactions conceptualized in the 'first-order' factor model. Those in the second school of thought (Damsgaard and Lyytinen 1998) view factor based approaches as inadequate for studying the complex IOS adoption phenomena.

The interpretive philosophy is frequently criticized by its opponents for producing inconclusive results. After studying an interpretive paper a reader is often left wondering what such analytical descriptions mean or how they are useful. Kurnia and Johnston (2000) state that

“While this approach promises to give greater depth of understanding of dynamic and complex interactions of organizations within the industry in IOS adoptions, one must acknowledge that it provides a reduced ability to make general statements. Furthermore due to the complexity and richness of the analysis it may create barriers to the interpretation of the findings particularly for practitioners.”

3.3 Critical Philosophy in Inter-Organizational Systems (IOS) Adoption Research

The central principles of critical philosophy as identified by Orlikowski and Baroudi (1991) are

- i. Social reality is historically constituted, hence human beings, organizations and societies are not confined to existence in a particular state.
- ii. The role of a researcher is to expose the hidden contradictions and unfulfilled potentiality in the societal order and initiate changes in the social relations and practices.
- iii. “Critical theorists do not share common philosophical standards for the evaluation of theories. What is acceptable theory or explanation is still debatable. This ambiguity of evaluation may be difficult for proponents of the dominant research tradition to accept, given their experience with positivism’s relatively unambiguous criteria for what constitutes valid knowledge.” (Orlikowski and Baroudi 1991 p.23).

We did not find papers in our sample that can absolutely be categorized under critical philosophy. However, we did find applications of a critical philosophy concept “totality” in our sample. As distinctive features of critical philosophy were not found in those papers we have categorized the papers under the other philosophies. The “totality” concept denotes that a phenomenon does not exist as an isolated element; instead it is related to its context through multiple relations which are essentially interdependent. Johnston and Gregor (2000) use an adapted version of this concept for developing a Structuration type IOS adoption theory. In this theory, a firm and its actions are rationalized as within its immediate industry environment and external environment. Damsgaard and Lyytinen (1998) use micro, meso and macro concepts and their interrelations for rationalizing an outcome. Their work could have been categorized as under critical philosophy had they focused on the structural contradictions between buyers and suppliers and initiated changes for altering the status quo. Their objective seems to be rooted in the implementation science instead.

4. Discussion

As it can be seen from the sample quite a few interpretive papers have been published in journals such as *Journal of Strategic Information Systems* (e.g. (Damsgaard and Lyytinen 1998)) and in conferences such as HICSS (e.g. (Kurnia and Johnston 2002)), while at the same time, a classical positivist work about EDI adoption is published in the journal *Information System Research* (Chwelos, Benbasat et al. 2001). With IOS adoption research poised to take off to new heights in the e-business age, which of the philosophies should one adopt? Can one integrate the philosophies instead of choosing one over other? A number of approaches have been suggested to do just that.

Kurnia and Johnston (2000) propose that positivist factor based studies be conducted first to understand the relationship between multiple independent variables and IOS adoption – the dependent variable. “Second-order” interpretive studies should then be conducted to improve the understanding of the complex bi-directional relations among the independent and dependent variables in the positivist research framework and to refine the research framework for better representing reality. According to this framework, scientific progression

would take place as the refined framework is tested using factor based methods and then refined using interpretive methods and so on and so forth.

In contrast to Kurnia and Johnston, Lee (1991) suggests that researchers first conduct interpretive studies to reach a rich understanding. From this understanding, a list of variables may be chosen to be tested in positivist studies across multiple settings. Lee presents a three-level understanding framework to operationalize his suggestion. The first level is the subjective understanding held by the practitioners who create the reality. The second level is the interpretive understanding that the researcher obtains by interacting with the subjects in focus. The third level is the positivist understanding which also belongs to the researcher. This understanding is created and tested across a large sample in order to explain the studied empirical reality. Like Kurnia and Johnston's framework, Lee's framework is iterative. Both of the frameworks suggest knowledge accumulation through cumulativeness either within the same study or among multiple studies.

Mingers (2001) provides the philosophical reasoning for Kurnia and Johnston's and Lee's suggestions. He argues that research paradigms are simply "constructions of thoughts" and that it's a fallacy to hold that the world must conform to these paradigms. Hence, their definitions should not be considered as static, but rather as evolving. He further argues that paradigms are "permeable at the edges" and thus not incommensurable.

Mingers' thinking is countered by the work of Falconer and Mackay (1999) who argue that cross-paradigmatic research is "ill-founded" and that multi-paradigm proposals that operate at the epistemological level fail to recognize the paradigmatic differences at the deeper ontological level. The central disagreement in the discussion is at the ontological level, about whether or not different ontologies can be mixed. Orlikowski and Baroudi (1991) provide a partial resolution to this discussion by classifying and characterizing interpretive philosophy as under weak and strong constructionists. They argue that while positivist and weak constructionist research can be inter-related and cumulated upon, positivist and strong constructionist research cannot because they are conceptual opposites.

If we are to adopt Orlikowski and Baroudi's position, the IOS adoption field is rather fortunate. In our sample, all of the interpretive work adopted weak constructionist ideology and thus Kurnia and Johnston's (2000) suggestion for integrating positivist and interpretive research seems a relevant option for the IOS adoption field. With the emergence of interpretivist research, we predict the application of strong constructionist work in the IOS adoption field in the future. Judging from the discussions in the IS field, the critical philosophy and a hybrid of the critical and interpretive philosophies might also be applied for studying IOS adoption in future studies.

Our stance on the philosophy debate is as follows; each of the philosophies has its strengths and weaknesses. While through applying interpretive philosophy one can understand the dynamics associated with the adoption process in detail, interpretivism is ineffective for creating context free rules. Positivist philosophy in contrast tests relationships between two or more abstract variables across contexts with the objective of creating universal rules, but in the pursuit of generality the insights lose contact with the individual contexts. We believe researchers should select a philosophy that is appropriate for achieving their objectives. We argue in the line of Mingers (2001), Lee (1991) and Kurnia and Johnston (2000) that knowledge accumulated in different philosophies can be inter-related and built upon. It is not optimal for science if the philosophy strands continue to develop independently. Specifically, we advocate Lee's subjective-interpretive-positivist understanding cycle for cumulative knowledge development.

In our review of the IOS adoption field, however, we have not been able to find any completed cycles of knowledge generation among researchers applying the two research philosophies. Interpretivist researchers often quote positivist research as part of the previous work in the field, and their research addresses what they believe to be shortcomings in the positivist research. But we have not found evidence that the insights produced in interpretivist research is being discussed or applied in subsequent positivist research.

5. Conclusion

Our objective in writing this paper has been two-fold. First to depict the scientific progress within positivist, interpretive or critical philosophy strands in the IOS adoption field and second to provide an overview of the discussions about inter-relating philosophies in the IS field. We apply Orlikowski and Baroudi's (1991) framework that classifies research as relying on a foundation of assumptions from either positivism, interpretivism or critical theory. We found the framework well suited for our review of the field since it facilitated a coherent presentation of the discussion about interrelating philosophies through a review of literatures in the larger IS and the organizational science fields, thus achieving our second objective.

While positivist studies have dominated the field of IOS adoption research since its emergence as a separate field in the mid 1980s, interpretivist studies are gaining ground in both conference proceedings and journals, and they can no longer be ignored by the traditional positivist researchers. For the sake of the scientific progress of the field more work must be done toward combining the insights from positivist and interpretivist studies. From the same inclusive philosophy we also encourage research in IOS adoption using the critical theory tradition as we feel this will advance the scientific field.

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